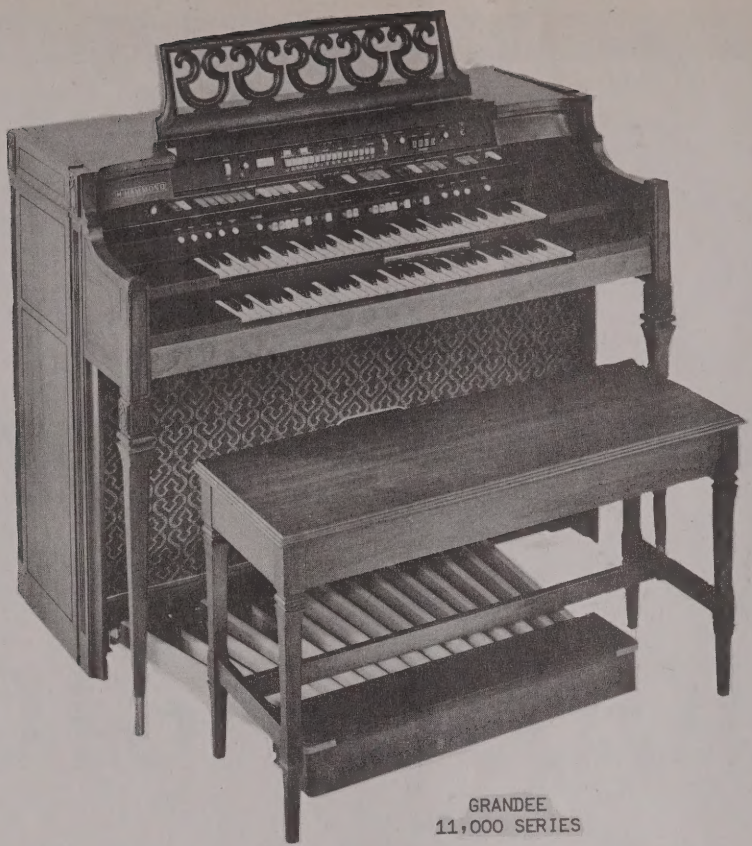
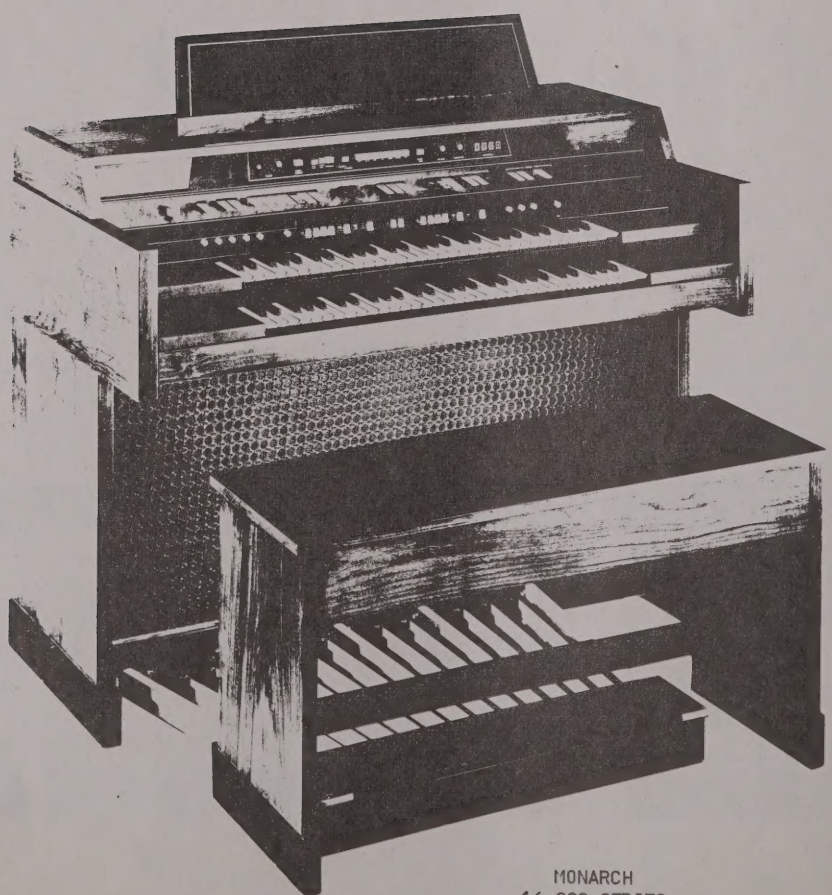
SERVICE MANUAL

11100 & 16100 SERIES ORGAN

HAMMOND ORGAN COMPANY
DIVISION OF HAMMOND CORPORATION
11700 Copenhagen Court • Franklin Park, Ill. 60131
312—766-6950



GRANDEE
11,000 SERIES



MONARCH
16,000 SERIES

TABLE OF CONTENTS

SECTION I - HOW THE ORGAN OPERATES

1- 1	General Description	1- 1
1- 2	Manuals (Keyboards)	1- 1
1- 3	Tone Source	1- 1
1- 4	Poly-Synthesis Percussion	1- 1
1- 5	Second Voice - (Percussions become Organ)	1- 1
1- 6	Sustain Tabs	1- 1
1- 7	Pedals - Lower to Pedals and Sustain	1- 2
1- 8	Tremolo - Upper and Lower	1- 2
1- 9	Vibrato 1 and 2	1- 2
1-10	Reverb 1 and 2	1- 2
1-11	Brilliance Tab	1- 2
1-12	Volume Soft Tab	1- 2
1-13	Preset Pistons	1- 2
1-14	Arpeggiator (11,000 Series Only)	1- 2
1-15	Expression or Swell Pedal	1- 3
1-16	Speakers	1- 3
1-17	Auto Vari Rhythm Units	1- 3
1-18	Music Lamp (11,000 Series Only)	1- 3
1-19	Phone Jack Assembly	1- 4
1-20	Head Phone Jack	1- 4
1-21	Amplifier	1- 4
1-22	Remote Tone Cabinet	1- 4
1-23	Cassette Recorder (Optional)	1- 4

SECTION II - DISASSEMBLY AND MAINTENANCE

(DISASSEMBLY)

2- 1	General Note	2- 1
2- 2	Removal of Rear Cover (Back)	
2- 3	Top and Auto Vari Assembly (To lift and swing up)	2- 1
2- 4	To Gain Access to Auto Vari Rhythm Assembly	2- 1
2- 5	To Remove Auto Vari Rhythm Assembly	2- 1
2- 6	Control Panel Assembly (To lift and Swing up)	2- 1
2- 7	Tab & Switch Assembly Removal	2- 2
2- 8	Piston Preset (Removal	2- 2
2- 9	Line Switch (Removal)	2- 2
2-10	Tone Bar Assemblies	2- 2
2-11	Upper Manual (To Lift and Swing Up)	2- 2
2-12	Upper or Lower Manual PWB Removal	2- 2
2-13	Front Strip and Access to Arpeggiator Assembly	2- 2
2-14	Lower Manual (Lift and Swing Up)	2- 2
2-15	Phone Jack and End Block Assemblies	2- 2
2-16	Swell Pedal Assembly	2- 3
2-17	Pedal Switch Assembly	2- 3
2-18	Fold Out Panel - From Rear of Organ	2- 3
2-19	Tremolo - (Swing Out)	2- 3
2-20	Amplifier Assembly	2- 3
2-21	Removal of Printed Wiring Boards	2- 3
2-22	To Replace Upper or Lower Manual Keys	2- 3

TABLE OF CONTENTS CONTINUED

MAINTENANCE AND SERVICE INFORMATION

Test and Adjustment Procedures - 11,000 Series 2- 4
Test and Adjustment Procedures - 11,000 Series 2- 5
Test and Adjustment Procedures - 11,000 Series 2- 6
Test and Adjustment Procedures - 11,000 Series 2- 7
Tab Voices Various Tone Bar Settings 2- 8
Test and Adjustment Procedures - 16,000 Series 2- 9
Test and Adjustment Procedures - 16,000 Series 2-10
Test and Adjustment Procedures - 16,000 Series 2-11
Maintenance 2-12
Cleaning Keys and Tabs
Cleaning Woodwork
Moving or Shipping
Service & Parts
Service Information 2-13
Transient Keying, Auto Vari-64
Circuit Change made to Auto Accompaniment Board
124-000360 - (124-000444 Replaces 124-000360 Board)..... 2-14
Schematic and Layout Changes for 124-000360 Board..... 2-15

FREQUENCY AND SIGNAL FLOW CHARTS

Manual Key, Tone Bar and Filter Frequency Chart 2-16
Upper Tone Bars and Presets (Signal Flow)..... 2-17
System Mixer and Amplifier (Signal Flow)..... 2-18
Upper Synthesis Percussion (Signal Flow)..... 2-19
Bright Percussion System (Signal Flow)..... 2-20
Lower Tone Bars and Presets (Signal Flow)..... 2-21
Pedal Tone Bars (Signal Flow)..... 2-22
Rhythm and Associated Circuitry (Signal Flow)..... 2-23

ILLUSTRATIONS

Plug and Connector Locations - 11,000 Series 2-24
Plug and Connector Locations - 11,000 Series 2-25
Plug and Connector Locations - 16,000 Series 2-26
Plug and Connector Locations - 16,000 Series 2-27

SECTION III - DIAGRAMS AND TEXT

3- 1 thru 3-42 List of Illustrations (11,000 Series)..... 3- 1 thru 3- 2
11,000 Series thru 3-44
3-43 thru 3-61 List of Illustrations (16,000 Series)..... 3-45 thru 3-46
16,000 Series thru 3-65

SECTION IV - ILLUSTRATED PARTS LIST

4- 1 Index - 11,000 Series ..... 4- 1 thru 4-13
4-14 Index - 16,000 Series ..... 4-14 thru 4-21

Appendix not included at this time

Appendix Index ..... A- 1

LIST OF ILLUSTRATIONS
11,000 SERIES-GRANDEE

FIGURE				PAGE
	LIST OF ILLUSTRATIONS (11,000 SERIES)			3- 1
3- 1	11,000 SERIES CONSOLE LOGIC DIAGRAM	(SHEET 1 OF 2)		3- 2
3- 2	11,000 SERIES CONSOLE LOGIC DIAGRAM	(SHEET 2)F 2)		3- 3
3- 3	11,000 SERIES CONSOLE BLOCK DIAGRAM			3- 4
3- 4	MDD GENERATOR BOARD Schematic, Layout and Theory	(124-000265)	(1)	3- 5
3- 5	UPPER MANUAL SYNTHESIS MOTHER BOARD Schematic, Layout and Theory	(124-000223-002)	(2)	3- 6
3- 6	STAIRCASE WAVE PERCUSSION BOARD Schematic, Layout and Theory	(124-000340)	(3)	3- 7
3- 7	LOWER MANUAL SYNTHESIS DAUGHTER BOARD Schematic, Layout and Theory	(124-000223)	(4)	3- 8
3- 8	LOWER MANUAL SYNTHESIS DAUGHTER BOARD Schematic, Layout and Theory	(124-000341)	(5)	3- 9
3- 9	UPPER MANUAL PRE-SETS BOARD Schematic and Layout	(124-000351)	(6)	3-10
3-10	LOWER MANUAL PRESETS BOARD Schematic and Layout	(124-000352)	(7)	3-11
3-11	I.C. 380 DIVIDER KEYER PACKAGE Schematic	(075-000380)	(8)	3-12
3-12	SINE WAVE FILTER #1 Board Schematic, Layout and Theory	(124-000201)	(8)	3-13
3-13	SINE WAVE FILTER #2 Board Schematic and Layout	(124-000202)	(9)	3-14
3-14	SINE WAVE FILTER #3 Board Schematic and Layout	(124-000204)	(10)	3-15
3-15	UPPER MANUAL SYNTHESIS PERCUSSION BOARD Schematic and Layout	(124-000350)	(11)	3-16
3-16	REPEAT OSCILLATOR AND DETECTOR BOARD Schematic and Layout	(124-000353)	(12)	3-17
3-17	PEDAL FILTER BOARD Schematic, Layout and Theory	(124-000206)	(13)	3-18

LIST OF ILLUSTRATIONS
(CONTINUED)

FIGURE	11,000 SERIES		PAGE
3-18	BRIGHT PERCUSSION FILTER BOARD ..... Schematic, Layout and Theory	(124-000208) ..... (14)	3-19
3-19	MIXER BOARD #2 - Schematic & Layout Theory	(124-000374) ..... (15)	3-20
3-20	MIXER BOARD #3 - Schematic & Layout Theory	(124-000377) ..... (16)	3-21
3-21	AUTO CHORD BOARD - Schematic & Layout ..... Early Models see Page 2 for 124-000360 Board.	(124-000444) ..... (17)	3-22
3-22	MISCELLANEOUS BOARD - Schematic, Layout Theory.	(124-000365) ..... (18)	3-23
3-23	ARPEGGIATOR BOARD - Schematic, Layout & Theory	(124-047850)	3-24
3-24	REVERBERATION BOARD -Schematic,Layout & Theory	(124-000166)	3-25
3-25	POWER SUPPLY ASSEMBLY - Schematic & Layout....	(126-000108-001 THRU 003)	3-26
3-26	RECTIFIER AND RELAY BOARD-Schematic & Layout..	(124-000355).....	3-27
3-26	FUSE BOARD - Schematic & Layout.....	(124-000354).....	3-27
3-27	35 WATT AMP BOARD - Schematic, Layout & Theory	(124-000169).....	3-28
3-28	AUTO VARI - 64 -Rhythm Unit Logic Diagram		3-30
3-29	AUTO VARI - 64 - Rhythm Theory of Operation...	(SHEET 1 OF 2)	3-31
3-30	AUTO VARI - 64 - Rhythm Theory of Operation..	(SHEET 2 OF 2)	3-32
3-31	PATTERN GENERATOR BOARD - Schematic & Layout..	(124-000379)	3-33
3-32	RHYTHM VOICING BOARD- Schematic & Layout	(124-000380)	3-34
3-33	VARIATION BOARD - Schematic & Layout	(124-000418)	3-35
3-34	AUTO VARI - 64 - Rhythm Tracks and Variations Chart		3-36
3-35	WIRING DIAGRAMS FOR CASSETTE AND EARPHONE- Terminal Strips, Animation Cancel, Speaker & Pedal Terminal Strips.....		3-37
3-36	CONTROL PANEL TAB SWITCH - Wiring Chart and Chart Abbreviations Code.....		3-38
3-37	PLUG & PIN NUMBERS WIRING CHART..... See Figure 3-36 for Abbreviations Code	(P-1 THRU 27)	3-39
3-38	PLUG AND PIN NUMBERS WIRING CHART..... See Figure 3-36 for Abbreviations Code.....	(P-29 THRU 80)	3-40

LIST OF ILLUSTRATIONS
(CONTINUED)
11,000 SERIES

FIGURE		PAGE
3-39	PLUG & PIN NUMBERS WIRING CHART .....(P-83 THRU J-108U) ..... See Figure 3-36 For Abbreviations Code	3-41
3-40	PLUG & PIN NUMBERS WIRING CHART.....(J108L THRU J115) ..... See Figure 3-36 for Abbreviations Code	3-42
3-41	PLUG & PIN NUMBERS WIRING CHART.....(J115 THRU J136) ..... See Figure 3-36 for Abbreviations Code	3-43
3-42	PLUG & PIN NUMBERS WIRING CHART.....(J137 THRU J257)	3-44

LIST OF ILLUSTRATIONS

16,000 SERIES

FIGURE				PAGE
	LIST OF ILLUSTRATIONS (16,000 SERIES)			3-45
3-43	16,000 SERIES CONSOLE LOGIC DIAGRAM	(SHEET 1 OF 2)		3-46
3-44	16,000 SERIES CONSOLE LOGIC DIAGRAM	(SHEET 2 OF 2)		3-47
3-45	16,000 SERIES CONSOLE BLOCK DIAGRAM			3-48
3- 4	MDD GENERATOR BOARD Schematic, Layout and Theory	(124-000265)	1	3- 5
3- 5	UPPER MANUAL SYNTHESIS MOTHER BOARD Schematic, Layout and Theory	(124-000223-002)	2	3- 6
3- 6	STAIRCASE WAVE PERCUSSION BOARD Schematic, Layout and Theory	(124-000340)	3	3- 7
3- 7	LOWER MANUAL SYNTHESIS DAUGHTER BOARD Schematic, Layout and Theory	(124-000223)	4	3- 8
3- 8	LOWER MANUAL SYNTHESIS DAUGHTER BOARD Schematic, Layout and Theory	(124-000341)	5	3- 9
3- 9	UPPER MANUAL PRESET BOARDS Schematic and Layout	(124-000351)	6	3-10
3-10	LOWER MANUAL PRESET BOARD Schematic and Layout	(124-000352)	7	3-11
3-11	I.C. 380 DIVIDER KEYER PACKAGE Schematic	(075-000380)		3-12
3-12	SINE WAVE FILTER #1 BOARD Schematic, Layout and Theory	(124-000201)	8	3-13
3-13	SINE WAVE FILTER #2 BOARD Schematic and Layout	(124-000202)	9	3-14
3-14	SINE WAVE FILTER #3 BOARD SCHEMATIC AND LAYOUT	(124-000204)	10	3-15
3-15	UPPER MANUAL SYNTHESIS PERCUSSION BOARD Schematic and Layout	(124-000350)	11	3-16
3-16	REPEAT OSCILLATOR AND DETECTOR BOARD Schematic and Layout	(124-000353)	12	3-17
3-17	PEDAL FILTER BOARD	(124-000206)	13	3-18

LIST OF ILLUSTRATIONS CONTINUED

16,000 SERIES

FIGURE			PAGE
3-18	BRIGHT PERCUSSION FILTER BOARD ..... Schematic, Layout, and Theory	(124-000208)... (14)	3-19
3-46	MIXER #2 BOARD ..... Schematic, Layout, and Theory	(124-000376).... (15)	3-49
3-20	MIXER #3 BOARD ..... Schematic, Layout, and Theory	(124-000377).... (16)	3-21
3-47	AUTO ACCOMPANIMENT BOARD ..... Schematic, Layout, and Theory	(124-000424).... (17)	3-50
3-24	REVERBRATION BOARD - Schematic, Layout & Theory...	(124-000166).....	3-26
3-48	POWER SUPPLY ASSEMBLY - Schematic	(126-000117 thru 118) ..	3-51
3-49	POWER SUPPLY & AMPLIFIER ASSEMBLY WIRING DIAGRAM ..	(126-000117 thru 118)..	3-52
3-27	35 WATT AMP BOARD - Schematic, Layout & Theory ...	(124-000169)	3-29
3-50	AUTO VARI-28 RHYTHM THEORY OF OPERATION		3-54
3-51	AUTO VARI -28 RHYTHM LOGIC DIAGRAM		3-55
3-52	AUTO VARI - 28 RHYTHM BOARD LAYOUT	(124-000430)	3-56
3-53	AUTO VARI - 28 RHYTHM BOARD SCHEMATIC	(124-000430)	3-57
3-54	AUTO VARI - 28 RHYTHM TRACKS & VARIATION CHART		3-58
3-55	CONTROL PANEL TAB SWITCH WIRING CHARTS		3-59
3-55	CHART OF ABBREVIATIONS CODE		3-59
3-56	PLUG AND PIN NUMBERS WIRING CHART ..... See Figure 3-55 for Abbreviations Code	(P-1 THRU P-27)	3-60
3-57	PLUG AND PIN NUMBERS WIRING CHART ..... See Figure 3-55 for Abbreviations Code	(P31 THRU P-80).....	3-61
3-58	PLUG & PIN NUMBERS WIRING CHART ..... See Figure 3-55 for Abbreviations Code	(P-83 THRU J-108U).....	3-62
3-59	PLUG & PIN NUMBERS WIRING CHART ..... See Figure 3-55 for Abbreviations Code	(J-108L THRU J-115U)....	3-63
3-60	PLUG & PIN NUMBERS WIRING CHART ..... See Figure 3-55 for Abbreviations Code	(J-115L THRU J-131) ..	3-64
3-61	PLUG & PIN NUMBER WIRING CHART ..... See Figure 3-55 for Abbreviations Code	(J-141 THRU J-255) ..	3-65

SECTION I
HOW THE ORGAN OPERATES

11,000 AND 16,000 SERIES

1-1 GENERAL -- This section briefly describes some of the features and functions of the instruments. Though they are very similar, the 11,000 Grandee will mainly be discussed.

The Grandee is a self-contained Console with two 61 key manuals and a 25 note pedal keyboard. It features poly-synthesis percussion, upper, lower and pedal keyboard tonebars, upper and lower manual preset pistons and tab switch controls. Additional features include the Auto-Vari Rhythm unit with automatic Accompaniment, Acoustic Tremolo (rotary speaker), Vibrato, Reverberation and (11,000 Series only) Arpeggiator.

1-2 MANUALS -- There are two 61 key manuals of block module design, Each key has a single contact to a non-grounding bass, providing a means of switching the keying voltage to the divider keyers. Both manuals pivot upwards for easy access.

1-3 TONE SOURCE -- The Grandee uses the multi-derivative divider (MDD) system driven by a tuneable oscillator associated with a vibrato oscillator. A gate between these oscillators, produce a delayed vibrato. The output of a single master oscillator is divided into 13 top frequencies by the large scale integrated circuit network (LSIC) on the MDD board which in turn, drives four generator keyer systems. The mother boards provide the necessary division of outputs and frequencies which are subsequently shaped and synthesized into tones keyed by the manuals.

1-4 POLY-SYNTHESIS PERCUSSION -- The tabs 2, 3, and 5 are individually pure harmonic voices, 2nd, 3rd and 5th. The Glock, Xylophone and Marimba are synthesized combinations of these harmonics. Bright tones which are filtered, form the Pizzicato 1 and 2, Banjo, Harpsichord and Piano percussive voices. IT MUST BE NOTED that the percussion does not sound on lowest 12 keys of the upper manual. All percussive tones are heard only through stationary speakers, offering a contrast between non-vibrato percussion and regular organ tones channelled through the Tremolo Animation. NOTE: SOME OF THE ABOVE VOICES NOT INCLUDED IN THE 16,000 SERIES.

The "Piano Solo" has the same qualities as "Piano" but when tab is depressed it cancels all other upper manual registrations including repeat and percussion fast tabs. It is also heard at a slightly louder level.

1-5 SECOND VOICE - (PERCUSSIONS BECOME ORGAN)-- The second voice tab acts as a control switch. When the second voice tab is in the up position, the five bright voices (Pizzicato 1 & 2, Banjo, Harpsichord, and Piano) operate in a percussive mode. With the second voice tab in the down position the five bright voices (Oboe, Sax, Posthorn, Violin and Diapason operate in a normal organ mode.

1-6 SUSTAIN TABS -- The two upper sustain tabs (long or short) add two degrees of sustain to any tone bar registration on the upper manual, but does not affect the preset registrations.

1-6 SUSTAIN TABS (CONTINUED)-- Sustain to foot switch (11,000 only) turns on long sustain for the upper manual when this tab is depressed and the foot switch on the left side of the expression pedal is activated.

1-7 PEDALS -- The 25 note console pedal switch contains single contacts to a common buss to key the pedal voices.

PEDAL SUSTAIN -- used with pedal tone bar, two degrees of decay after pedal note is released is available.

LOWER TO PEDAL - permits the 25 pedal to energize the first 25 keys on the lower manual.

1-8 TREMOLO - UPPER AND LOWER -- Depressing these tabs channel signals keyed by the upper and lower manual to the rotary speaker.

CELESTE: Changes to the speed of the rotating speaker from fast to slow.

CHORUS: This tab function creates an equal blending between the stationary main speaker and the Tremolo rotary speaker of all tones directed to the Tremolo channel. (11,000 series only) 16,000 SERIES -HAS ONLY A SINGLE ANIMATION CHANNEL.

1-9 VIBRATO 1 AND 2 --

VIBRATO 1 - gives manual tones a slow and narrow vibrato.

VIBRATO 2 - a much faster and wider vibrato, both channeled through the stationary main speaker.

DELAY VIBRATO - must always be used with Vibrato 1 or 2. It provides a delay in vibrato when a note is depressed and played in a detached manner.

1-10 REVERB 1 & 2 -- Used singly or together these tabs provide three degrees of reverberation channeled to the stationary main speaker.

TREMOLO ON REBERB. (11,000 SERIES ONLY) -- The reverb output is also fed into the rotary speaker Tremolo channel.

1-11 BRILLIANCE -- This tab adds brightness to the manual tones when extra brilliance is desired.

1-12 VOLUME SOFT -- This tab reduces the over all volume while retaining full range of the expression pedal.

1-13 PRESET PISTONS -- There are two sets of preset pistons, upper and lower. The upper piston - offers four solo voices, Clarinet 8', String 8', full Tibias 16' and Theatre Brass 16'.

PERCUSSION ONLY - this piston cancels tone bar registration.

UPPER TONE BARS AND PERCUSSION - depressing tab cancels presets and restores tone bar and percussion registrations.

THE LOWER PISTON - offer three Accompaniment voices. Flutes & Strings 8', Tibias 8' and Ensemble 8'.

LOWER TONE BARS - cancels presets and restores tone bar registrations.

1-14 ARPEGGIATOR (11,000 SERIES ONLY)- The 49 note Arpeggiator is located between the two manuals. The switch to the right of the Arpeggiator allows the player to select manual or automatic mode. When the manual mode is selected, running finger along the strip sounds a scale composed of notes keyed on the lower manual, in voices selected on the upper manual. In automatic mode, pressing finger along strip produces a pleasing arpeggio in proper whole tone scale to harmonize with keys depressed on the lower manual. When no keys are depressed, running finger along the arpeggiator strip, produces every note on a chromatic

1-14 ARPEGGIATOR (CONTINUED) -- scale (Glissando) in manual or automatic mode. Although lower manual keys and voices remain operable, the Arpeggiator can key upper manual voices only.

1-15 EXPRESSION PEDAL (11,000 SERIES ONLY)-- The expression pedal has three photo cell channels controlling the audio output of them simultaneously. They are Main, Tremolo and Rhythm. It also contains two side foot switches. The left foot switch cancels signals to the Tremolo system and re-directs them to stationary speakers. This switch also adds long sustain to the upper manual registeration. The right foot switch cancels automatic rhythm.

THE 16,000 SERIES - utilizes only a two channel system, Main and Tremolo. The two foot cancel switches are also not incorporated in this Model.

1-16 SPEAKERS -- The main speaker compliment consists of a 15" Bass and a 6" Treble Speaker. The Tremolo unit contains a 6 x 9 oval extended range speaker.

1-17 AUTO VARI - 64 (11,000 SERIES ONLY) AUTOMATIC RHYTHM & ACCOMPANIMENT

The Auto Vari has 16 rhythm patterns controlled by interlocking push buttons which can be depresses singularly or in two or three pattern combinations. There are four lighted variation switches which select any one of four variations of the sixteen rhythm patterns. These variations can be activated automatically by setting the Auto

1-17 AUTO VARI (CONTINUED)

Vari Switch to any of the six measure rates. If the six position measure rate knob is placed on the "2" position, every 2 measures, a new variation will be selected automatically in an A, B, C, D sequence.

The Silent/Sound Rocker Switch is the primary control for the rhythm unit. Silent position rhythm can not be heard, but play along voices can be. When in the sound position, Automatic rhythms will sound, starting with beat one at measure one. There is a volume control and a tempo control which varies the tempo rate from 12 to 75 measures per minute. The four play along voices, Brush, Snare, triggered by the lower manual and Cymbal and Bass, triggered by the pedals.

AUTO ACCOMPANIMENT - Depressing lower manual keys or pedal will activate pedal chord rhythms automatically to the pattern and tempo selected.

AUTO-VARI-28 (16,000 SERIES ONLY) The Auto-Vari 28 functions similarly to the Auto-Vari 64, but has only 7 rhythm patterns and 28 rhythm pattern variations. Also the four play along voices, Brush, Cymbal, and Bass triggered by lower manual or pedals are not included.

1-18 MUSIC LAMP (11,000 SERIES ONLY) Switch to the right of the rhythm unit, independent of the regular power switch, illuminates music above as well as tabs and keyboard below.

1-19 PHONE JACK -- Located on the power amplifier chassis, an RCA type jack is provided for use with external signal generating devices. Input impedance is 50K ohms and maximum signal permissible is 0.25V RMS.

1-20 HEAD PHONE JACK -- The phone jack is stereo-mono compatible. No adapter needed and is located on the right side of the organ and under the lower manual. It is connected so as to silence both the internal and optional remote speaker when the plug is inserted.

1-21 AMPLIFIER -- The power assembly include two standard 35 watt amplifier module and fused protected. Phone jack, tone cabinet, tremolo relay are also included.

1-22 REMOTE TONE CABINET -- A socket is provided on the amplifier suitable for a Leslie #700 tone cabinet. The console tabs affecting channeling and tremolo speed in organ will perform the same modes in the #700.

1-23 CASSETTE RECORDER (OPTIONAL)--

The organ is not equipped with an in-built cassette recorder, but provision is made for easy installation of cassette kit #130-10300.

SECTION II
DISASSEMBLY AND MAINTENANCE

11,000 & 16,000 SERIES

DISASSEMBLY PROCEDURE

2-1 GENERAL -- The following instructions describe a main disassembly sequence and procedure for removing and replacing specific assemblies. Re-assembly is accomplished by using reverse procedure. It is very important that care is taken to avoid damaging or scratching organ finish or assemblies when handling or removing. For access to any specific component or assembly, it may be necessary to use combinations of several of these steps.

NOTE: The 11,000 and 16,000 Series are very similar instruments, differences are in a few less features in the 16,000. This disassembly procedure is written mainly for the 11,000, adapting it to the 16,000 series should present no real problem.

2-2 REAR COVER - BACK --

a) Remove four (4) Bronze screws mounting cover to manual shelf.
b) Turn twist locks on top edge of back cover to horizontal position.
c) Remove back and interlock A.C. cord from organ.
d) By removing the rear cover, all A.C. line voltage has been broken. The A.C. cord and rear cover are of an interlock type to power supply in the organ.

2-3 TOP AND AUTO VARI RHYTHM ASSEMBLY (TO LIFT AND SWING UP)

a) From the front of the organ, firmly grasp each side of the top assembly and lift up, disengaging stud lock on top assembly from spring clips on organ.
b) The complete top assembly is hinged and can be placed in the swing up position.
c) 11,000 ONLY - On under side of top panel locate locking rods, insert rod into hole in bracket mounted to case side, locking top in position.

2-4 TO GAIN ACCESS TO AUTO VARI RHYTHM ASSEMBLY.

a) Remove ten (10) hex screws securing metal cover to Auto Vari Rhythm Chassis, remove cover.
b) (11,000 ONLY) If the potentiometers on the Auto Vari need adjusting, it is not necessary to remove cover. Holes are provided in cover for the purpose.

2-5 TO REMOVE AUTO VARI RHYTHM ASSEMBLY.

a) Remove tempo, measures and volume knobs, also remove caps from toggle switches.
b) Remove three (3) hex screws (each side) mounting Auto Vari assembly to top assembly.
c) Lower assembly slightly, remove plastic collar of lite emitting, letting diodes hang loosely attached only to the Auto Vari Chassis.
d) Remove complete unit.

NOTE: 16,000 has a smaller unit, but similar.

2-6 CONTROL PANEL - SWING-UP

a) Carefully lift each side of control panel to disengage stud-lock from spring clip in Upper Manual and Tone Bar base.
b) Control panel assembly is hinged

2-6 CONTROL PANEL - SWING UP CONTINUED

and now can be placed in the swing up position.

2-7 TAB AND SWITCH ASSEMBLY REMOVAL

a) With control assembly in the up position, locate "U" spring clip on the bottom of tab module to be replaced. With pick or similar tool, pry down and remove clip.
b) By carefully pulling tab switch assembly down and back, guiding tab from control panel window, module will now be free to be worked on.
c) To re-assemble switch assembly to control assembly, guide tab assembly back thru control panel window, insert top portion of module in slot top of control bracket. When tab assembly is in proper position, replace "U" spring clip.

2-8 PISTON PRESETS - REMOVAL

a) Upper and lower piston presets assemblies are removed similarly. Locate and remove hex screws mounting piston bracket to control panel. Lift slightly and pull back piston assembly clearing control panel. Assemblies are now free to be worked on.

2-9 LINE SWITCH - REMOVAL

a) By grasping plastic tabs on rear of switch and firmly squeezing, switch can be pushed out through front of control panel.

2-10 TONE BAR ASSEMBLIES

a) Top and control assemblies in the swing-up position. Remove hex screws mounting Tone Bar Assembly to Upper Manual Base.
CAUTION: DO NOT over tighten hex screws when re-assembling plastic tone bar assembly to metal base.
b) To remove knob and indicator strip, locate and remove small screw under knob and pull knob and indicator strip forward.
c) Contact can be removed by removing small screw at rear of tone bar and carefully backing out contact.

2-11 UPPER MANUAL (TO LIFT AND SWING UP)

a) From under Lower Manual shelf and toward the rear, locate and remove one (1) 1/4" x 1-1/2" bolt from each side.
b) Grasping manual assembly on each end (not by the keys) swing hinged manual up into position.
NOTE:To replace upper manual keys, follow procedure outlined in step 2-22.

2-12 UPPER OR LOWER MANUAL PWB REMOVAL

a) With manual in the up position, remove five (5) screws mounting PWB boards to manual frame. Care must be taken when removing contacts from actuator as not to bend or damage contacts. Care must also be taken to re-assembly.

2-13 FRONT STRIP AND ACCESS TO ARPEGGIATOR ASSEMBLY (11,000 ONLY)

a) With Manual in the up position, remove seven (7) hex screws across bottom of front strip.
b) Slide front strip forward and off.
c) From under side of front strip, with pick or similar tool, pry up and out five (5) spring clips holding arpeggiator assembly to front strip. Remove assembly.

2-14 LOWER MANUAL (LIFT AND SWING UP)

a) Locate and remove under Lower Manual shelf and toward front, two (2) 1/4" x 1-1/2" bolts.
b) Grasp each end of Lower Manual and raise into position.
NOTE: To replace lower manual keys follow procedure as outlined in Step 2-22.
c) To remove lower manual PWB boards follow procedure outlined in Step 2-12.

2-15 PHONE JACK AND END BLOCK ASSEMBLIES

a) The removal of some sub-assemblies is obvious. These will not be discussed.

2-16 SWELL PEDAL ASSEMBLY.

a) From front of organ, remove four (4) screws mounting swell pedal to bottom wood shelf, swell lifts out.

2-17 PEDAL SWITCH ASSEMBLY

a) From front of console, pry up each end of pedal assembly, disengaging stud from spring clip mounted to heavy metal crossbar.
b) Lifting front of assembly to clear contacts over crossbar, pull switch assembly forward disengaging rear studs, lift out. Reassembly by reversing procedure.

2-18 FOLD OUT PANEL - FROM REAR OF ORGAN

a) To swing down panel, locate latch at top and center of fold out panel. Push latch to the right and upwards.
b) Hinged panel can be lower to fold-out position.

2-19 TREMOLO (SWING OUT)

a) Remove hex screw located upper right at tremolo board. Swing hinged unit to the left to gain access to drum assembly.

2-20 AMPLIFIER

a) Remove four (4) pal nuts. One from each corner of chassis mounting amp to bottom shelf. Amp can be lifted out.

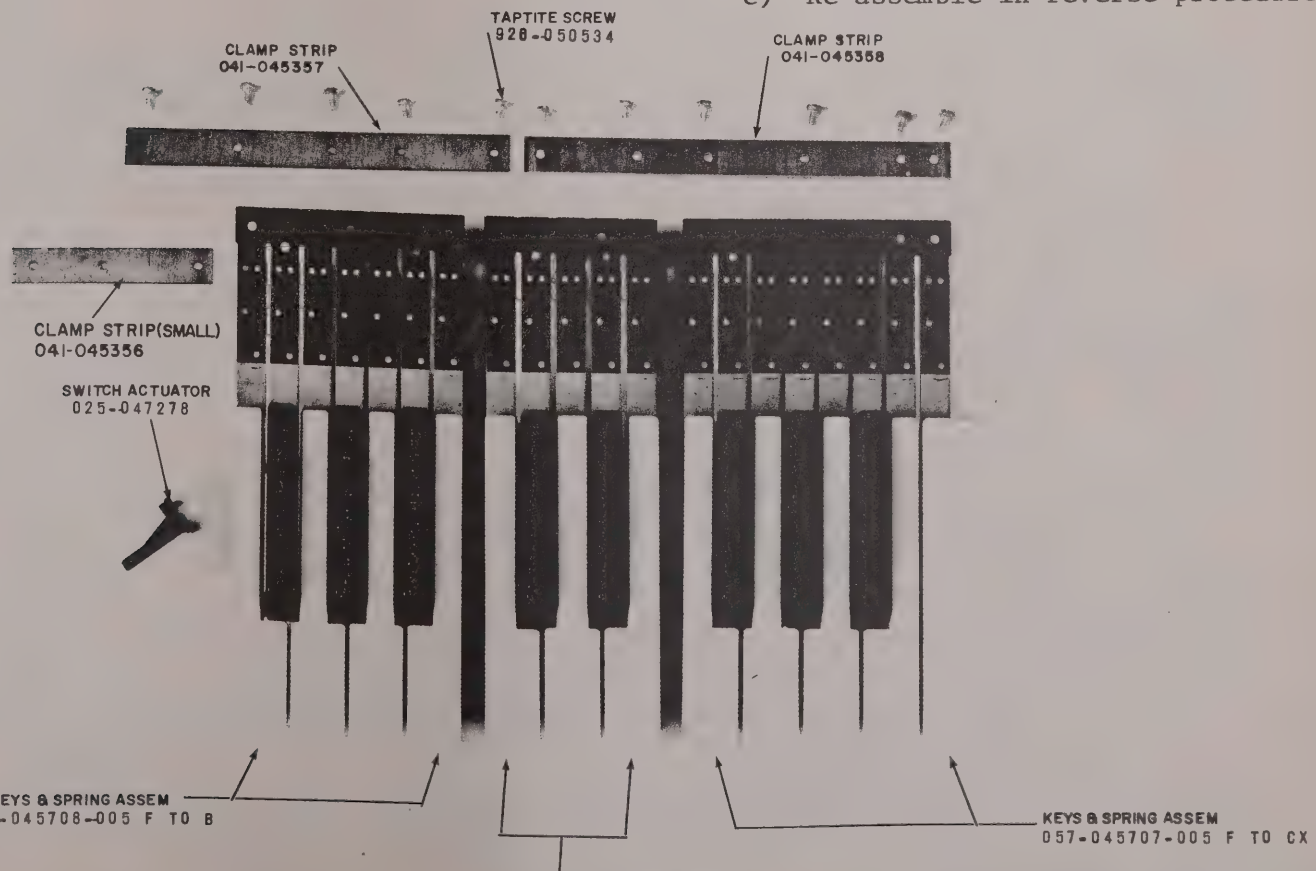
2-21 REMOVAL OF PRINTED WIRING BOARDS

a) Disconnect all plugs connected to printed wiring boards before removal. ALWAYS GROUND YOURSELF TO the organ chassis before touching any of the boards containing I.C.'s (Integrated circuits.)

2-22 TO REPLACE UPPER OR LOWER MANUAL KEYS

Keys cannot be replaced individually. Key module or key section will be needed. To determine which module or section is to be used see "KEY AND SPRING ASSEMBLY" below.

a) Proceed by removing screws and strip associated with defective module.
b) Lift rear of key module and carefully push forward separating actuator from contacts and lift up. Care must be taken when removing actuator from contacts as not to bend or damage contacts.
c) Re-assemble in reverse procedure.



TEST AND ADJUSTMENT PROCEDURES

GRANDEE - 11,000 SERIES

STEP	TEST AND TEST POINT	DEPRESS TAB OR EXTEND TONE BAR	PLAY KEYS	ADJUST	OSCILLOSCOPE OR OTHER INDICATION	FIG.
	POWER SUPPLY VOLTAGES					
1	Terminal Strips On Partition Behind Swell Housing			124-000209 Bd. a) R-7 b) R-17 c) R-27 d) R-37	 +25 volts - Red -28 volts - Violet -14 volts - Gray -8 volts - White	
	MAIN CHANNEL LEVEL					
2	Across Main Speaker	a) All U/M Tone Bars. Brilliance U/M Tone Bars & Percussion Piston b) Add Volume Soft	Key #25 Upper Manual	R-22, Main Adjust. (124-000377) Main Channel	a) 3.0 Volts RMS b) .6 volts - 1.2 volts RMS	
	UPPER MANUAL CUT-OFF					
3	U/M Mother Board 124-000223-002 (U/M 380 Assy.) Bare Wire	Same as Step 2(a)		R-8 Keyer Cut-Off (124-000223-002)	-2.5 volts Maximum D.C. Bias if Audible Feed-Thru, Reduce bias .5 volt Just Below Feed-Thru Point.	
	MINIMUM SWELL-MAIN CHANNEL					
4	Across Main Speaker	All U/M Tone Bars. Brilliance U/M Tone Bars & Percussion Piston	Key #25 Upper Manual	Expression Pedal To Minimum	90 to 180 MV	
	AUTO/ACCOMP. NULL ADJUST					
5	(Auto Vari)	Auto-Accomp. Sil/Sound - on Ballad - on Tempo - Medium Continuous Volume - Minimum		R-18 Acc. Null (124-000360 Bd)	Minimum Audible Thump	
	LOWER MANUAL LEVEL BALANCE					
6	Across Main Speaker	a) All L/M Tone Bars. Brilliance L/M Tone Bars Piston b) Depress Volume Soft	a) Key #25 Lower Manual	a) R-1 Acc. In. (124-000360 Bd.	a) 3.0 volts RMS b) .6 volts - 1.2 Volts RMS	
	TREMOLO CHANNEL LEVEL					
7	a) P-3 Term. 5 on Power Supply (Tremolo Channel)	a) L/M Tone Bar Piston. Tremolo All L/M Tone Bars Brilliance	a) Key #25 Lower Manual	a) R-51 Adj. Tremolo. (124-000377 Bd.	a) 5.6 volts RMS	
	a) As in Step 7 (a)	b) As in Step 7(a) Depress Volume Soft.	b) Key #25 Lower Manual	b) Expression Pedal to Min.	b) 1.13 - 2.26 Volts RMS	
	MINIMUM SWELL TREMOLO CHANNEL					
	c) As in Step 7 (a)	c) As in Step 7 (a)	c) Key #25 Lower Manual		c) 160 - 320 MV	

NOTE: DURING TEST PROCEDURE THE FOLLOWING MUST BE MAINTAINED UNLESS OTHERWISE STATED.

a) SWELL PEDAL AT MAXIMUM

b) ALL TABS AND PRESETS IN THE UP OR OFF POSITION, ALL TONE BARS PUSHED IN WHEN STARTING EACH TEST.

STEP	TEST AND TEST POINT	DEPRESS TAB OR EXTEND TONE BAR	PLAY KEYS	ADJUST	OSCILLOSCOPE OR OTHER INDICATION	FIG.
	REVERBERATION LEVEL					
8	a) Across Main Speaker	a) U/M Tone Bar Percussion Piston Tremolo - on U/M Tone Bar Setting 000607080 Reverb - 1 +2 Vibrato - 2	Press 5 Keys 25, 26,27, 28, 29.	a) R-20 Reverb Level (124-000166)	a) 1.0 volts RMS	
	b) Listen	b) Tremolo on Reverb.	b) Same as Step 8 (a)		b) NOTE: Reverb is added to Tremolo Speaker	
	c) Listen	c) Turn off Tremolo on Reverb. Depress Reverb. 1 (only). Depress Reverb. 2 (only) Reverb 1 & 2	c) Same as Step 8 (a)		c) NOTE: Three increasing Reverb Levels. No Note Should Sound abnormally long after releasing keys.	
	REPEAT NULL AND RATE					
9	a) Listen	a) U/M Percussion only Piston Repeat Repeat Rate - Mid-Range	a) Any Upper Manual Key	a) R-28 Null Adjust. (124-000208 Bd)	a) Adjust to Minimum Audible Thump. (Repeat Rate Control Varies from 2 - 15 CPS)	
	BRIGHT PERCUSSION LEVEL					
10	Across Main Speaker	U/M Percussion Only Piston Repeat Repeat Rate at Maximum Pizzicato 1 & 2 Banjo Harpsichord Piano	Key #25 Upper Manual	R-17 Bright Level Adjust (124-000208)	1.4 Volts RMS	
	PIANO SOLO LEVEL					
11	Across Main Speaker	Piano Solo - On	Key #25 Upper Manual	R-69 -Piano Solo Level (124-000208)	25 Volt P/P	
	PERCUSSION CUT-OFF					
12	Listen	U/M Percussion Piston (only) Glock Xylophone Marimba	Hold Upper Manual Keys 25,29,31		Adjust Cut-off Pot Until Feed-Thru is Just Audible, then back off Until Feed-Thru just Disappears.	
	2ND VOICE LEVEL					
13	Across Main Speaker	2nd Voice Tab Percussion (only) Piston a) Add Diapason (only) b) Turn Off Diapason. Add Violin (Only)	a) Key #25 Upper Manual		a) 0.84 - 1.34 volt RMS b) 0.15 - o.30 Volt RMS	
		NOTE: The 2nd Voice Tab Acts as a Control switch. When the 2nd Voice Tab is in the up-position, the five bright voices (Pizzicato 1 & 2, Banjo, Harpsichord and Piano) Operate In a Percussive Mode. With the 2nd Voice Tab in the down position, the five Bright Voices(Oboe, Sax, Post Horn, Violin and Diapason Operate in a Normal Organ Mode.				
	PEDAL LEVEL					
14	Across Main Speaker	Pedal Tone Bar 16' Pedal Tone Bar 8'	Pedal #13	R-31 Pedal Lever (124-000360)	8.0 volt RMS	

STEP	TEST AND TEST POINT	DEPRESS TAB OR EXTEND TONE BAR	PLAY KEYS	ADJUST	OSCILLOSCOPE OR OTHER INDICATION	FIG.
	HUM LEVEL					
15	a) Across Main Speaker (Main Channel)	a) U/M Tonebars & Percussion Piston Tremolo Celeste Rhythm Tempo Lite, Out Music Rack Lite,on	a) No Keys or Pedals	a) Swell Pedal Maximum	a) 25 MV	
	b) Plug P-3, Pin 5 on power supply (Tremolo Channel)	b) Add Tremolo on Upper Tremolo on Lower	b) No Keys or pedals	b) Swell Pedal Maximum	b) 12 MV	
	TUNING					
16	Across Main Speaker	U/M Tone Bars & Percussion Piston Brilliance Upper Manual 2' Tone Bar	Key #61 Upper Manual	Adjust Coil (124-000265 Bd)	8364-8380 HZ	
	VIBRATO ADJUST (IF NECESSARY)					
17	a) At Capacitor Junction C-8, C-8 on the 124-000265 MDD Bd.			a) R-10. Vibrato Frequency (124-000265 Bd)	a) 152 M Sec.	
	b)			b) R-20 Vibrato Width (124-000265 Bd)	b) 6.0 volts P/P	
	c)	c) Delay Vibrato	c) Key #25 Upper Manual	c) R-6 Delay Width (124-000265 Bd)	c) 0.8 Sec.	
	SUSTAIN DECAY TIME					
18	Listening	U/M Tone Bars & Percussion Piston All Upper Manual Tonebars				
		a) Sustain Upper Short	a) Key #25 Upper Manual		a) 0.5 Sec. Decay	
		b) Sustain Upper Long	b) Same as above		b) 3.0 Sec. Decay	
		c) Sustain to Foot Switch Engage Left Switch on Swell Pedal	c) Same as above		c) NOTE: Decay Time Between 0.5 & 3.0 Sec.	
	SYNTHESIS PERCUSSION DECAY TIMES					
19	Listening	U/M Percussion (Only) Piston a) Blue Tab #2	Upper Manual Keys #25,29,32 Hold Keys until Sound dies away		a) 1.0 Sec. Decay	
		b) Blue Tab #3			b) 1.0 Sec. Decay	
		c) Blue Tab #5			c) 1.0 Sec. Decay	
		d) Glock			c) 0.5 Sec. Decay	
		e) Xylophone			e) 0.5 Sec. Decay	
		f) Marimba			f) 0.5 Sec. Decay	
	BRIGHT PERCUSSION DECAY TIMES					
20	Listening	U/M Percussion (Only) Piston 2nd Voice Tab in the Up position	Upper Manual Key 25,29,32. Hold key Until Sound dies away.			
		a) Pizzicato #1			a) 0.25 Sec. Decay	
		b) Pizzicato #2			b) 0.25 Sec. Decay	
		c) Banjo			c) 0.50 Sec. Decay	
		d) Harpsichord			d) 3.0 Sec. Decay	
		e) Piano			e) 3.0 Sec. Decay	

STEP	TEST AND TEST POINT	DEPRESS TAB OR EXTEND TONE BAR	PLAY KEYS	ADJUST	OSCILLOSCOPE OR OTHER INDICATION	FIG.
21	PEDAL SUSTAIN Listening	Pedal Tone Bar 16' Pedal Tone Bar 8' a) Pedal Sustain #1 b) Pedal Sustain #2	Any Pedal Note		a) 0.5 Sec. Decay b) 1.0 Sec. Decay	
22	AUTO VARI - 64 - RHYTHM ASSY. SNARE LEVEL ADJUST - HIGH FREQ. Across Main Speaker	Snare Drum Slide Switch "ON" Volume to Maximum (CW)	Any Lower Manual Key Approx. 5 Times Per Second	NOTE: Pin 12 of Connector Plug (rear of Auto Vari Chassis) P-5, must be grounded. This removes low Freq. content of snare, so that the Hi Freq. can be adjusted R-121 - Hi Freq. adjust. (124-000380)	22 volts P/P	
23	AUTO VARI - 64 BASS DRUM ADJUST - LOW FREQ. Across Main Speaker	Bass Drum Slide Switch "ON"	Depress any Pedal	NOTE: Remove Ground from Pin 12 of Plug 5. R-126 Low Freq. Adj. (124-000380)	25 volts P/P.	
24	AUTO VARI - 64 BRUSH LEVEL ADJUST Across Main Speaker	Brush Slide Switch "ON"	Any Lower Manual Key Approx. 5 times per Second	R-97 Brush Adj. (124-000380)	14 Volts P/P	
25	Across Main Speaker	Cymbal Slide Switch "ON"	Any Pedal Approx. 5 Times per Second	R-88 Cymbal Adj. (124-000380)	14 Volts P/P	

CHART FOR CHECKING BY COMPARISON - PISTON PRESET AND TAB VOICES VERSUS TONE BAR SETTINGS

GRANDEE - 11,000 SERIES
PISTON VERSUS TONEBARS

UPPER MANUAL

PISTON	TONE BAR SETTING	PLAY KEYS	FUNCTION CHECK
Clarinet 8'	008080800	Upper Manual Keys	To compare tones, alternately depress upper manual tone bar piston and appropriate preset piston.
String 8'	008888666	25,29,32	
Full Tibias 16'	806808006		
Theater Brass 16"	848868666		

LOWER MANUAL

Flute & String 8'	006242202	Lower Manual Keys	To compare tones, alternately depress lower manual tone bar piston and appropriate preset piston.
Tibias 8'	006628224	25,29,32	
Ensemble	008666444		

SYNTHESIS PERCUSSION TABS VERSUS TONE BAR SETTINGS

TAB	TONE BAR SETTING	PLAY KEYS	FUNCTION CHECK
Blue Tab #2	000800000	Upper Manual Keys	To compare tones alternately depress percussion only piston and upper manual tone bars and percussion piston.
Blue Tab #3	000080000	#23, 29, 32	
Blue Tab #5	000000800		
Glock	800800800		
Xylophone	000800080		
Marimba	008008000		
Piano	888776542		

STEP	TEST AND TEST POINT	DEPRESS TAB OR EXTEND TONE BAR	PLAY KEYS	ADJUST	OSCILLOSCOPE OR OTHER INDICATION	FIG.
	POWER SUPPLY VOLTAGES					
1	Terminal Strips On Partition Behind Swell Housing			124-000209 Bd. a) R-7 b) R-17 c) R-27 d) R-37	 +25 volts - Red -28 volts - Violet -14 volts - Gray -8 volts - White	
	MAIN CHANNEL LEVEL					
2	Across Main Speaker	a) All U/M Tone Bars. Brilliance U/M Tone Bars & Percussion Piston b) Add Volume Soft	Key #25 Upper Manual	R-22, Main Adjust. (124-000377) Main Channel	a) 3.0 Volts RMS b) .6 volts - 1.2 volts RMS	
	UPPER MANUAL CUT-OFF					
3	U/M Mother Board 124-000223-002 (U/M 380 Assy.) Bare Wire	Same as Step 2(a)		R-8 Keyer Cut-Off (124-000223-002)	-2.5 volts Maximum D.C. Bias if Audible Feed-Thru, Reduce bias .5 volt Just Below Feed-Thru Point.	
	MINIMUM SWELL-MAIN CHANNEL					
4	Across Main Speaker	All U/M Tone Bars. Brilliance U/M Tone Bars & Percussion Piston	Key #25 Upper Manual	Expression Pedal To Minimum	90 to 180 MV	
5	**PEDAL SUSTAIN** Listening	Pedal Tone Bar 16' Pedal Tone Bar 8' a) Pedal Sustain #1 b) Pedal Sustain #2	Any Pedal Note		 a) 0.5 Sec. Decay b) 1.0 Sec. Decay	
	LOWER MANUAL LEVEL BALANCE					
6	Across Main Speaker	a) All L/M Tone Bars. Brilliance L/M Tone Bars Piston b) Depress Volume Soft	a) Key #25 Lower Manual	a) R-60 Acc. In (124-000424 Bd.)	a) 3.0 volts RMS b) .6 volts - 1.2 Volts RMS	
	TREMOLO CHANNEL LEVEL					
7	a) P-3 Term. 5 on Power Supply (Tremolo Channel)	a) L/M Tone Bar Piston. Tremolo All L/M Tone Bars Brilliance	a) Key #25 Lower Manual	a) R-51 Adj. Tremolo. (124-000377 Bd.	a) 5.6 volts RMS	
	a) As in Step 7 (a)	b) As in Step 7(a) Depress Volume Soft.	b) Key #25 Lower Manual	b) Expression Pedal to Min.	b) 1.13 - 2.26 Volts RMS	
	MINIMUM SWELL TREMOLO CHANNEL					
	c) As in Step 7 (a)	c) As in Step 7 (a)	c) Key #25 Lower Manual		c) 160 - 320 MV	

NOTE: DURING TEST PROCEDURE THE FOLLOWING MUST BE MAINTAINED UNLESS OTHERWISE STATED.

a) SWELL PEDAL AT MAXIMUM

b) ALL TABS AND PRESETS IN THE UP OR OFF POSITION, ALL TONE BARS PUSHED IN WHEN STARTING EACH TEST.

STEP	TEST AND TEST POINT	DEPRESS TAB OR EXTEND TONE BAR	PLAY KEYS	ADJUST	OSCILLOSCOPE OR OTHER INDICATION	FIG.
	REVERBERATION LEVEL					
8	a) Across Main Speaker	a) U/M Tone Bar Percussion Piston Tremolo - on U/M Tone Bar Setting 000607080 Reverb - 1 +2 Vibrato - 2	Press 5 Keys 25, 26,27, 28, 29.	a) R-20 Reverb Level (124-000166)	a) 1.0 volts RMS	
	b) Listen	b) Tremolo on Reverb.	b) Same as Step 8 (a)		b) NOTE: Reverb is added to Tremolo Speaker	
	c) Listen	c) Turn off Tremolo on Reverb. Depress Reverb. 1 (only). Depress Reverb. 2 (only) Reverb 1 & 2	c) Same as Step 8 (a)		c) NOTE: Three increasing Reverb Levels. No Note Should Sound abnormally long after releasing keys.	
	REPEAT NULL AND RATE					
9	a) Listen	a) U/M Percussion only Piston Repeat Repeat Rate - Mid-Range	a) Any Upper Manual Key	a) R-28 Null Adjust. (124-000208 Bd)	a) Adjust to Minimum Audible Thump. (Repeat Rate Control Varies from 2 - 15 CPS)	
	BRIGHT PERCUSSION LEVEL					
10	Across Main Speaker	U/M Percussion Only Piston Repeat Repeat Rate at Maximum Pizzicato 1 & 2 Banjo Harpsichord Piano	Key #25 Upper Manual	R-17 Bright Level Adjust (124-000208)	1.4 Volts RMS	
	PIANO SOLO LEVEL					
11	Across Main Speaker	Piano Solo - On	Key #25 Upper Manual	R-69 -Piano Solo Level (124-000208)	25 Volt P/P	
	PERCUSSION CUT-OFF					
12	Listen	U/M Percussion Piston (only) Tab #2 Tab #3	Hold Upper Manual Keys 25,29,31	R-11 Cut Off Adj. 124-000350	Adjust Cut-off Pot Until Feed-Thru is Just Audible, then back off Until Feed-Thru just Disappears.	
	2ND VOICE LEVEL					
13	Across Main Speaker	2nd Voice Tab Percussion (only) Piston a) Add Diapason (only) b) Turn Off Diapason. Add Violin (Only)	a) Key #25 Upper Manual		a) 0.84 - 1.34 volt RMS b) 0.15 - o.30 Volt RMS	
		NOTE: The 2nd Voice Tab Acts as a Control switch. When the 2nd Voice Tab is in the up-position, the five bright voices (Pizzicato 1 & 2, Banjo, Harpsichord and Piano) Operate In a Percussive Mode. With the 2nd Voice Tab in the down position, the five Bright Voices(Oboe, Sax, Post Horn, Violin and Diapason Operate in a Normal Organ Mode.				
	PEDAL LEVEL					
14	Across Main Speaker	Pedal Tone Bar 16' Pedal Tone Bar 8'	Pedal #13	R-31 Pedal Lever (124-000206)	8.0 volt RMS	

STEP	TEST AND TEST POINT	DEPRESS TAB OR EXTEND TONE BAR	PLAY KEYS	ADJUST	OSCILLOSCOPE OR OTHER INDICATION	FIG.
	HUM LEVEL					
15	a) Across Main Speaker (Main Channel)	a) U/M Tonebars & Percussion Piston Tremolo Celeste Rhythm Tempo Lite, Out	a) No Keys or Pedals	a) Swell Pedal Maximum	a) 22 MV	
	b) Plug P-2 Pins 3 & 6 To Tremolo Unit	b) Add Tremolo on Upper Tremolo on Lower	b) No Keys or pedals	b) Swell Pedal Maximum	b) 16 MV	
	TUNING					
16	Across Main Speaker	U/M Tone Bars & Percussion Piston Brilliance Upper Manual 2' Tone Bar	Key #61 Upper Manual	Adjust Coil (124-000265 Bd)	8364-8380 HZ	
	VIBRATO ADJUST (IF NECESSARY)					
17	a) At Capacitor Junction C-8, C-8 on the 124-000265 MDD Bd.			a) R-10. Vibrato Frequency (124-000265 Bd)	a) 142 to 152 MSEC	
	b)			b) R-20 Vibrato Width (124-000265 Bd)	b) 5.4 to 6.6 volts P/P	
	c)	c) Delay Vibrato	c) Key #25 Upper Manual	c) R-6 Delay Width (124-000265 Bd)	c) 0.6 to 1.0 Sec.	
	SUSTAIN DECAY TIME					
18	Listening	U/M Tone Bars & Percussion Piston All Upper Manual Tonebars				
		a) Sustain Upper Short	a) Key #25 Upper Manual		a) 0.5 Sec. Decay	
		b) Sustain Upper Long	b) Same as above		b) 3.0 Sec. Decay	
	SYNTHESIS PERCUSSION DECAY TIMES					
19	Listening	U/M Percussion (Only) Piston	Upper Manual Keys #25,29,32 Hold Keys until Sound dies away			
		a) Blue Tab #2			a) 1.0 Sec. Decay	
		b) Blue Tab #3			b) 1.0 Sec. Decay	
	BRIGHT PERCUSSION DECAY TIMES					
20	Listening	U/M Percussion (Only) Piston 2nd Voice Tab in the Up position	Upper Manual Key 25,29,32. Hold key Until Sound dies away.			
		a) Pizzicato #1			a) 0.25 Sec. Decay	
		b) Pizzicato #2			b) 0.25 Sec. Decay	
		c) Banjo			c) 0.50 Sec. Decay	
		d) Harpsichord			d) 3.0 Sec. Decay	
		e) Piano			e) 3.0 Sec. Decay	

2-47 CLEANING

PLASTIC KEYS AND CONTROL TABS

Clean plastic keys and control tablets lightly with a soft, damp cloth or chamois. Wiping with a dry cloth builds up an electrostatic charge which will attract dust particles from the air. If cleaning agents are necessary, use pure facial soap and lukewarm water. Dry without excessive rubbing. Do not use boiling water, strong solvents such as alcohol, dry cleaning fluids, or window cleaning fluids which contain such solvents.

WOODWORK

Clean and dust the woodwork with a soft, damp cloth or chamois. If cleaning agents are necessary, use a soft cloth lightly dampened with a solution of mild soap and lukewarm water. Remove solution, using soft cloth dampened with clean water. Dry thoroughly, rubbing with the grain. Use a good grade liquid furniture wax or polish. Avoid use of paste waxes or oil type polishes. Excessive rubbing in one spot or at edges may result in damage to the finish.

MOVING OR SHIPPING

Arrange to have your organ properly packed by your Hammond Organ dealer if not be a regular furniture mover. Don't risk damage to the instrument by letting inexperienced movers handle it.

LOCATION OF CONSOLE

The back of the console should be at least two inches from the wall for ventilation and for the best acoustic results.

SERVICE

PRODUCT SERVICE

For product service, contact nearest authorized Hammond Service Center or write to: Manager, Product Service, Hammond Organ Company, 4200 West Diversey Avenue, Chicago, Illinois 60639.

PARTS ARE ALSO AVAILABLE BY CONTACTING PRODUCT SERVICE AS MENTIONED ABOVE.

IMPORTANT:

ALWAYS SUPPLY MODEL DESIGNATION AND SERIAL NUMBER WHEN WRITING.

Model AUTO-VARI -64

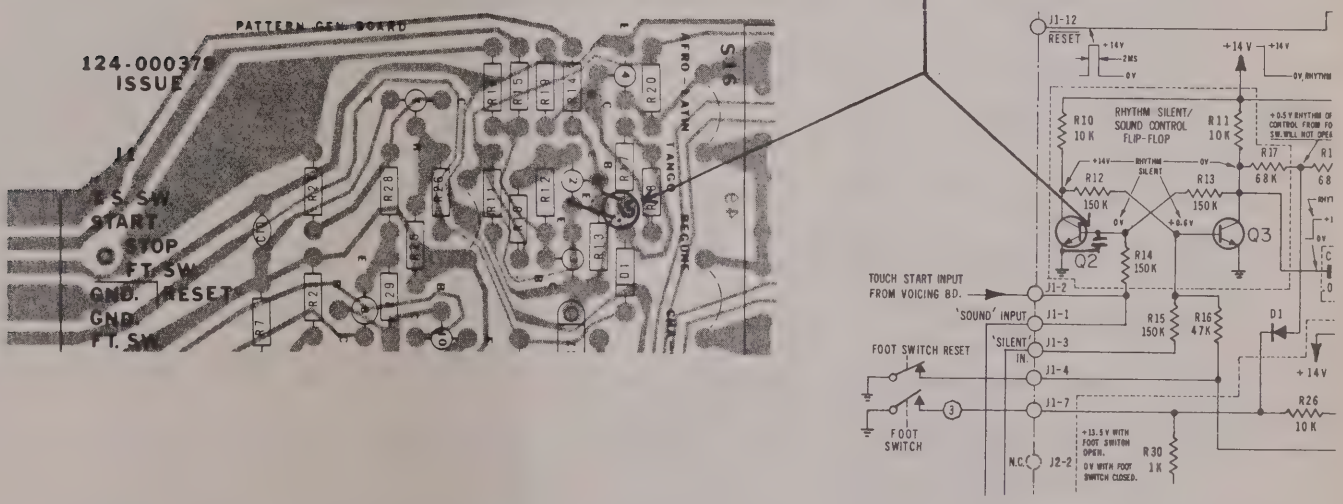
IN 11,100 MODEL

SUBJECT: TRANSIENT KEYING, AUTO-VARI 64

SYMPTOM - AUTO-VARI in touch start position. Turning the tremolo chorus switch on and off, triggers the rhythm unit on intermittently.

CORRECTION - Install .15 MFD capacitor from base to emitter of Q2 on 124-000379. (Install on copper pattern side of board, thus eliminating the need to remove PWB from unit). See below:

Engineering has investigated and will be incorporating the correction in future production of Auto-Vari units.



Model 11,000
GRANDEE

SUBJECT: CIRCUIT CHANGES IN AUTO-ACCOMPANIMENT
PWB 124-000360
(CURRENT PRODUCTION - 124-000444 BOARD REPLACES THE
124-000360 BOARD)

For improved performance, make the following circuit changes to PWB 124-000360. See Attached schematic for component location.

1. Add a diode (001-226080) and a 470 Ohm resistor (600-220411) in series between the input ends of R67 (4700 Ohms) and R49 (15K Ohms). The 470 ohm resistor should go to R67 (4700 Ohms) and the cathode end of diode to R69 (15K Ohms). These components should be supported by their leads on the component side of board.

2. Remove cathode end of diode D9 and stand straight up. Add a 220 Ohm resistor (600-220331) in the hole where D9 was just removed. Stand resistor up as the diode and connect to diode in series. See sketch on attached print.

3. Remove the anode end of diode D1 from board and stand straight up. Add a 2200 Ohm resistor (600-220571) as described in step 2 above.

4. Remove R14, 1000 Ohms, and replace with a jumper wire.

5. Change resistor R53 and R73 from 2200 Ohms to 4700 Ohms (600-220652).

6. Remove capacitor C25, .01 MFD

7. Change capacitor C40 from 100 MFD, 15V to 50 MFD, 25V (432-506259).

8. Change resistor R59 from 330K to 82K (600-220951).

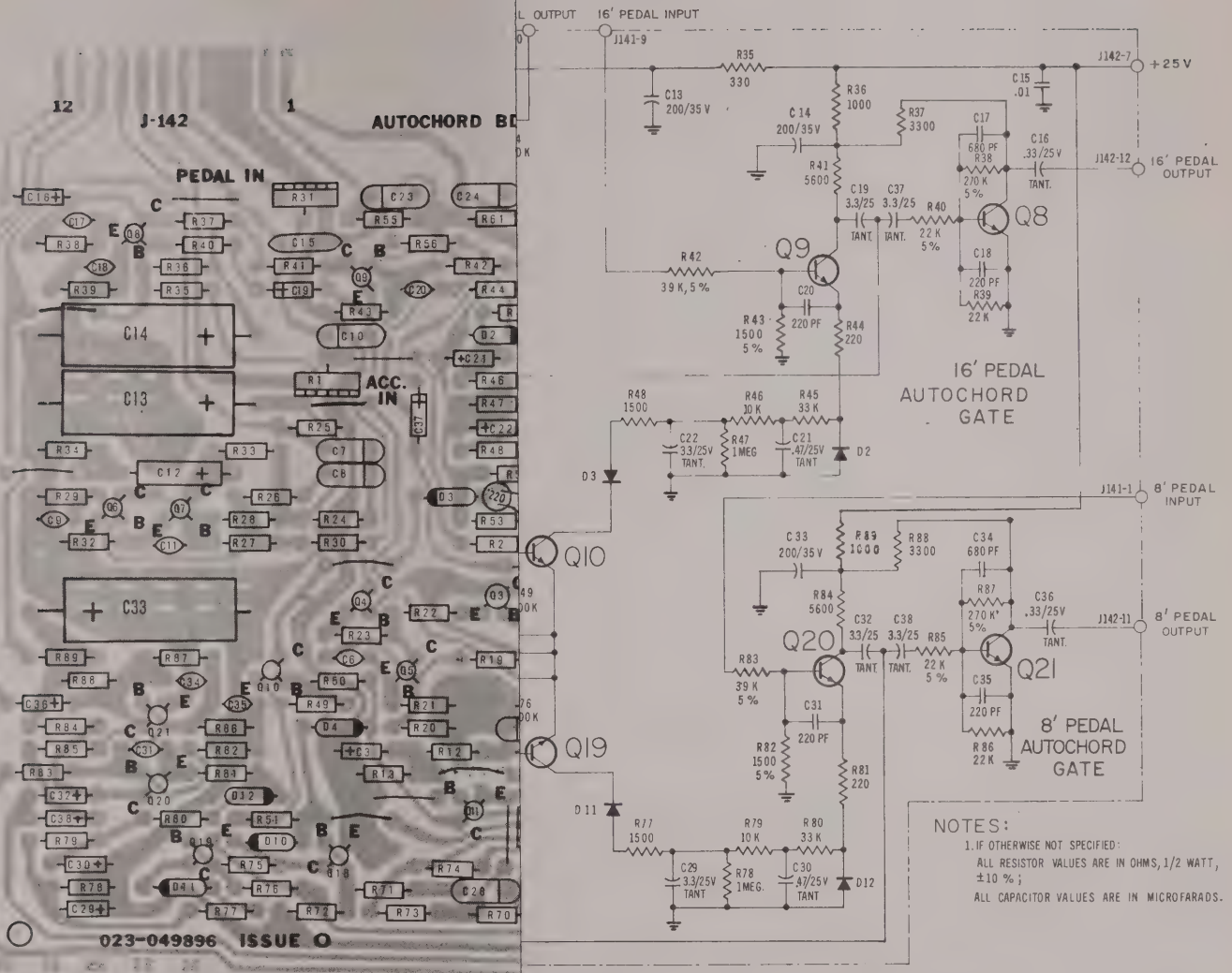
9. Change resistor R11 from 47K to 150K (600-221011).

10. Change resistors R22 and R23 from 470 Ohms to 220 Ohms (600-220332).

11. Change capacitor C3 from 0.68 MFD, 25V Tantalum to 0.33 MFD, 25V Tantalum (414-240042).

12. On the copper side of the board, add a 220 PF capacitor (426-010332) from base to emitter of Q12, Q16, and Q17. See attached PWB layout for location.

After above changes have been completed, the board part number will become 124-000444. If a complete PWB assembly is ordered for replacement, 124-000444 should be ordered as it is a direct replacement for 124-000360.



QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
2	Q1 & Q2 - MATCHED BETA PAIR	001-021260-001	2N5826
3	Q3, Q4, Q7	001-021133	2N3394
1	Q5	001-021132	2N3394
6	Q6, Q9, Q10, Q13, Q19, Q20	001-021135	2N3394
2	Q8, Q21	001-021260	2N5826
5	Q11, Q14, Q15, Q16, Q18	001-021172	2N4249
2	Q12, Q17	001-021173	2N4249
10	D1, D2, D3, D4, D5, D8, D9, D10, D11, D12	001-026080	1N4148

Model 11,000
GRANDEE

SUBJECT: CIRCUIT CHANGES IN AUTO-ACCOMPANIMENT
PWB 124-000360
(CURRENT PRODUCTION - 124-000444 BOARD REPLACES THE 124-000360 BOARD)

For improved performance, make the following circuit changes to PWB 124-000360. See Attached schematic for component location.

1. Add a diode (001-226080) and a 470 Ohm resistor (600-220411) in series between the input ends of R67 (4700 Ohms) and R49 (15K Ohms). The 470 ohm resistor should go to R67 (4700 Ohms) and the cathode end of diode to R69 (15K Ohms). These components should be supported by their leads on the component side of board.

2. Remove cathode end of diode D9 and stand straight up. Add a 220 Ohm resistor (600-220331) in the hole where D9 was just removed. Stand resistor up as the diode and connect to diode in series. See sketch on attached print.

3. Remove the anode end of diode D1 from board and stand straight up. Add a 2200 Ohm resistor (600-220571) as described in step 2 above.

4. Remove R14, 1000 Ohms, and replace with a jumper wire.

5. Change resistor R53 and R73 from 2200 Ohms to 4700 Ohms (600-220652).

6. Remove capacitor C25, .01 MFD

7. Change capacitor C40 from 100 MFD, 15V to 50 MFD, 25V (432-506259).

8. Change resistor R59 from 330K to 82K (600-220951).

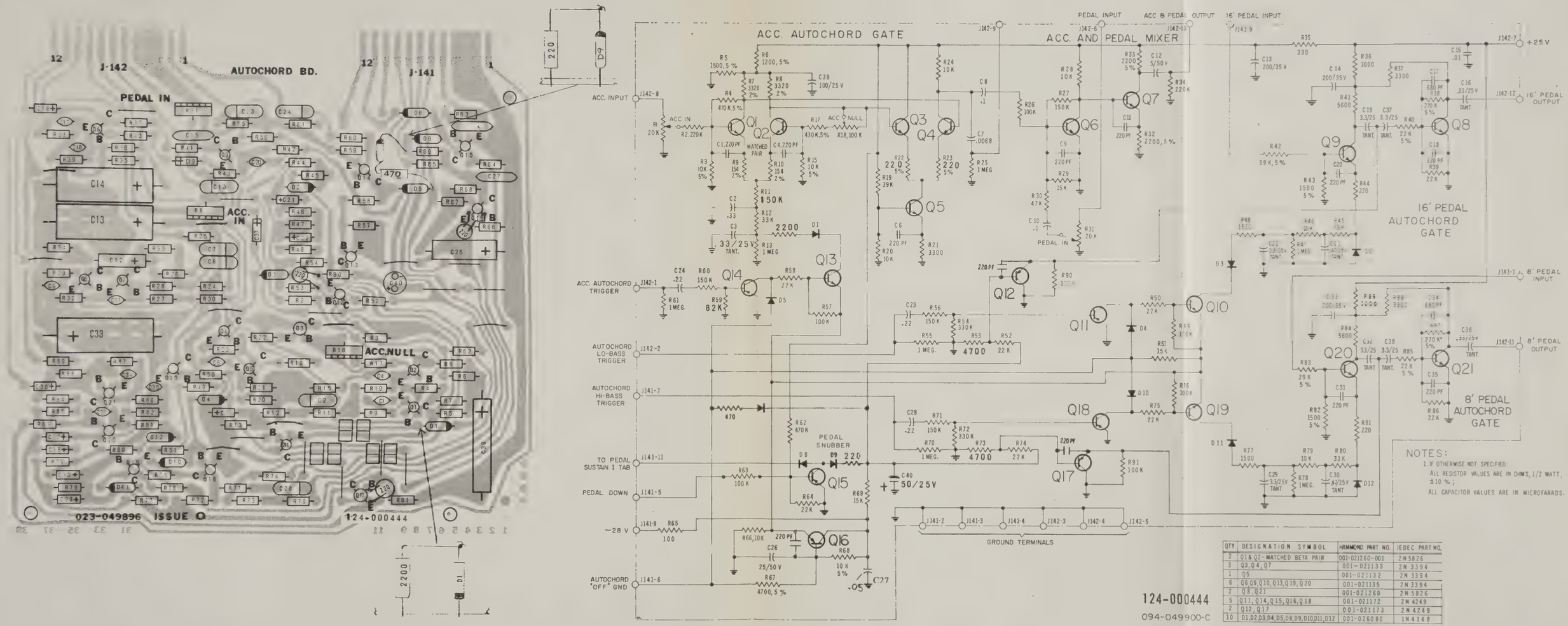
9. Change resistor R11 from 47K to 150K (600-221011).

10. Change resistors R22 and R23 from 470 Ohms to 220 Ohms (600-220332).

11. Change capacitor C3 from 0.68 MFD, 25V Tantalum to 0.33 MFD, 25V Tantalum (414-240042).

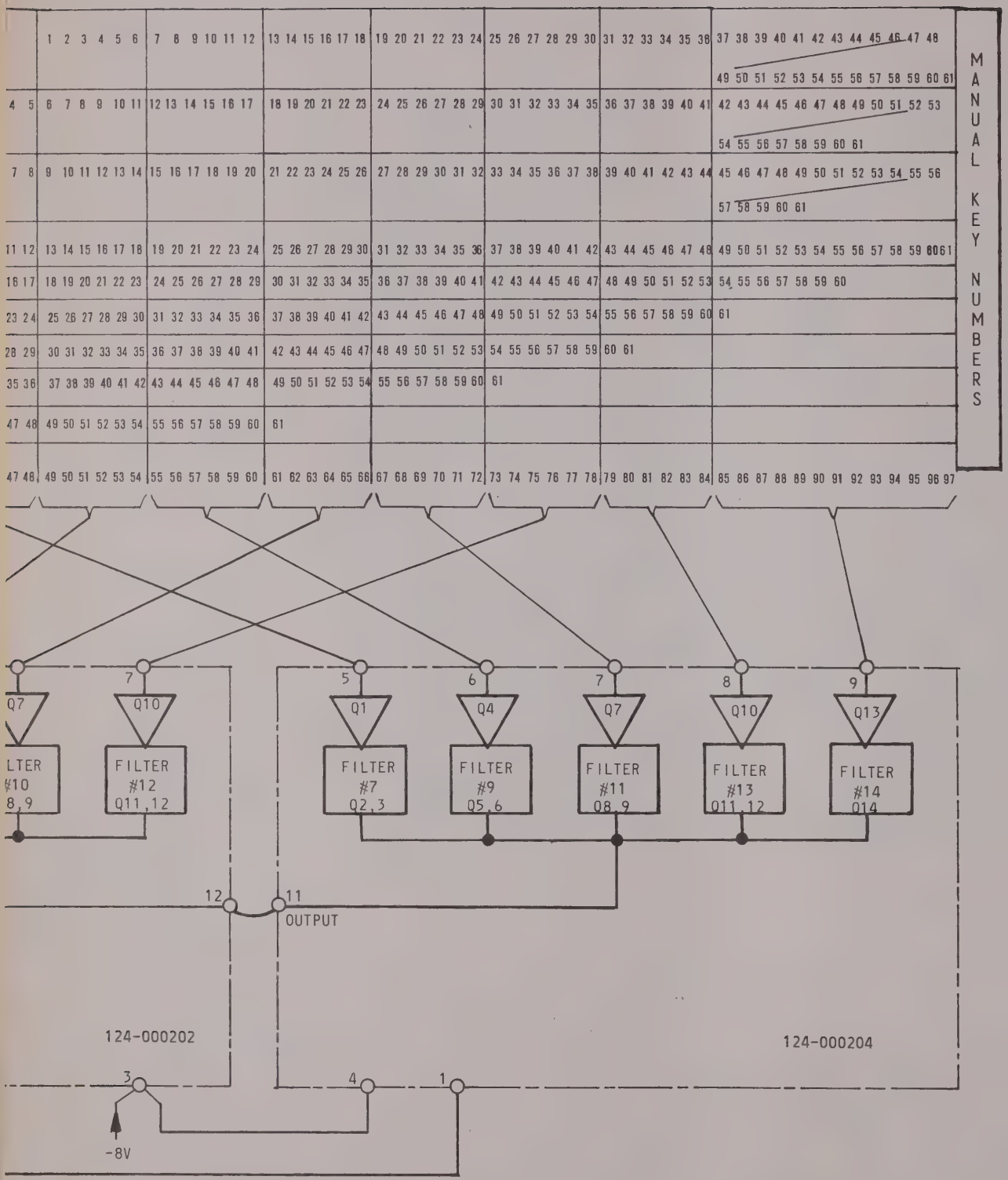
12. On the copper side of the board, add a 220 PF capacitor (426-010332) from base to emitter of Q12, Q16, and Q17. See attached PWB layout for location.

After above changes have been completed, the board part number will become 124-000444. If a complete PWB assembly is ordered for replacement, 124-000444 should be ordered as it is a direct replacement for 124-000360.

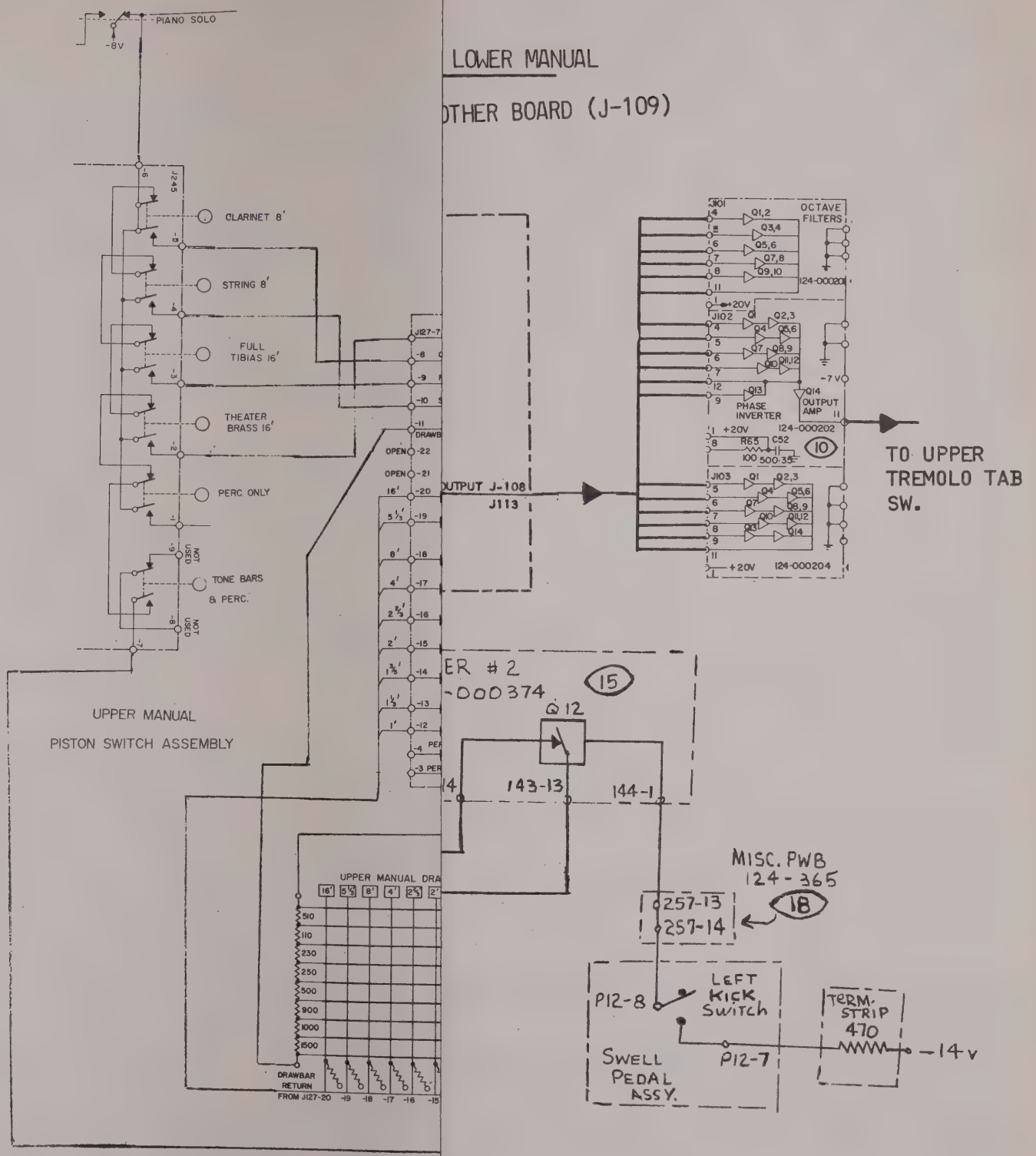


QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
2	Q1 & Q2 - MATCHED BETA PAIR	001-021260-001	2N5826
3	Q3, Q4, Q7	001-021133	2N3394
1	Q5	001-021132	2N3394
6	Q6, Q9, Q10, Q13, Q19, Q20	001-021135	2N3394
2	Q8, Q21	001-021260	2N5826
5	Q11, Q14, Q15, Q16, Q18	001-021172	2N4249
2	Q12, Q17	001-021173	2N4249
10	D1, D2, D3, D4, D5, D8, D9, D10, D11, D12	001-026080	1N4148

124-000444 AUTO ACCOMPANIMENT BOARD

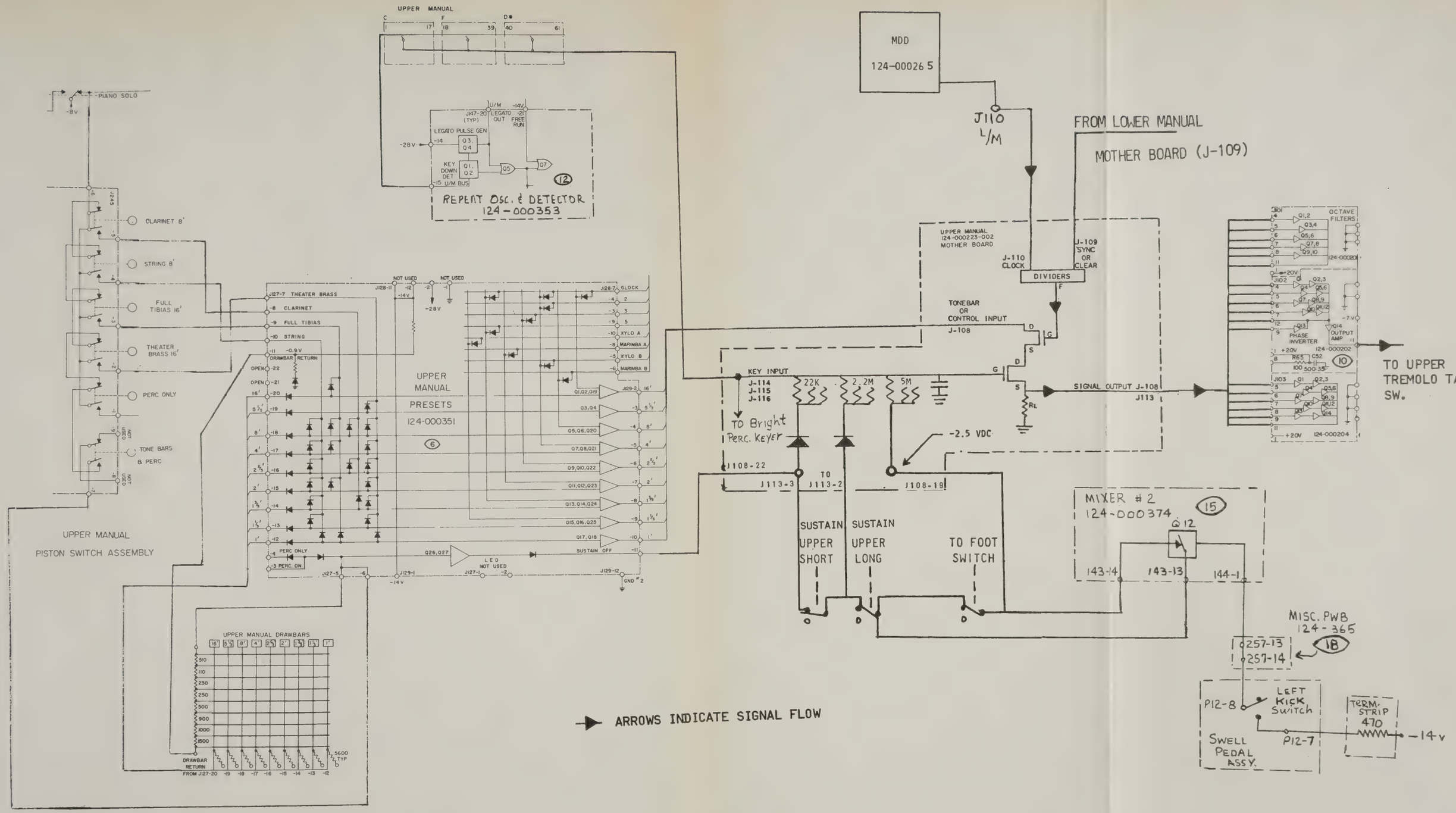


ER FREQUENCY CHART



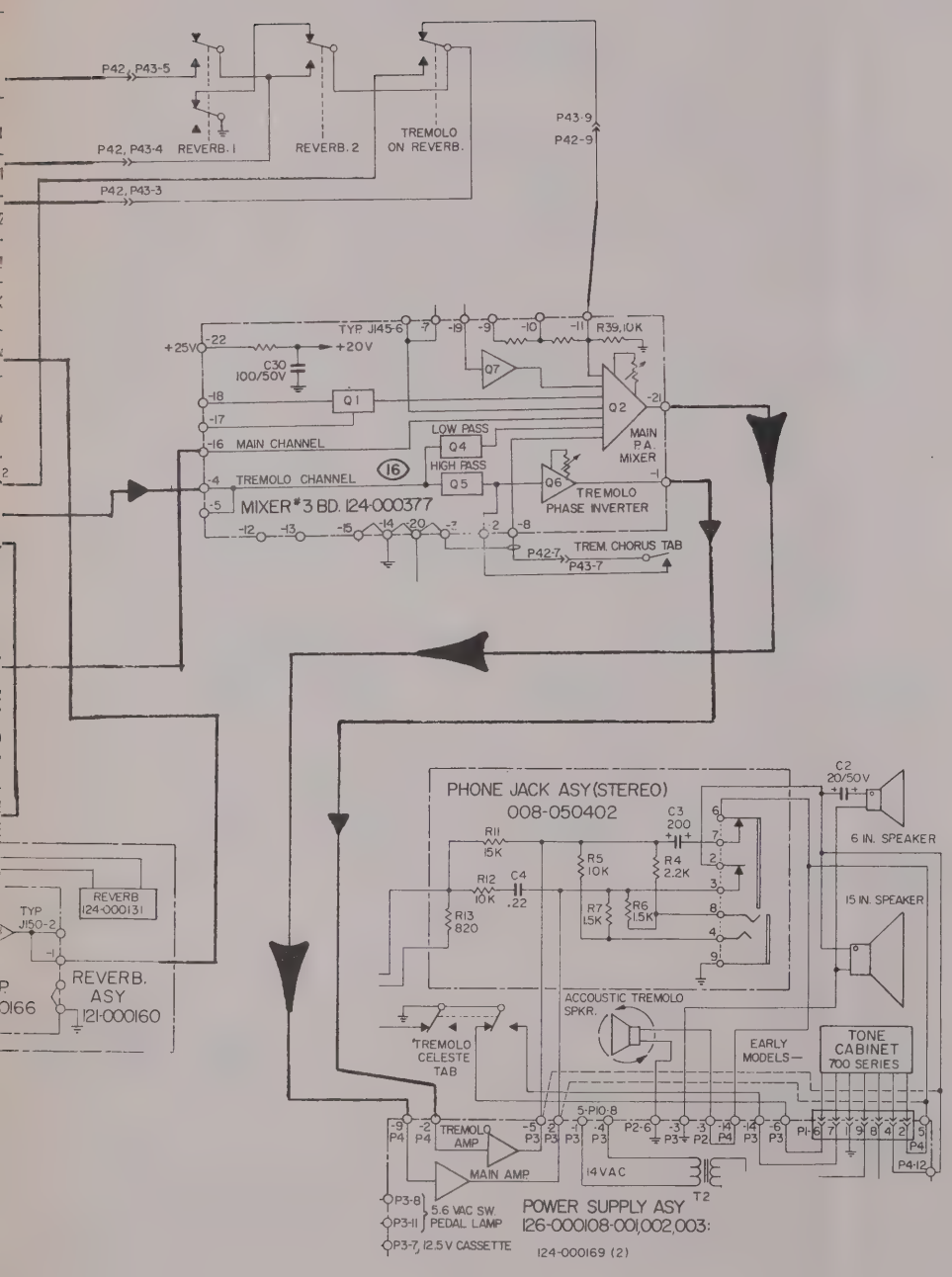
UPPER TONEBARS AND PRESETS

| | | |

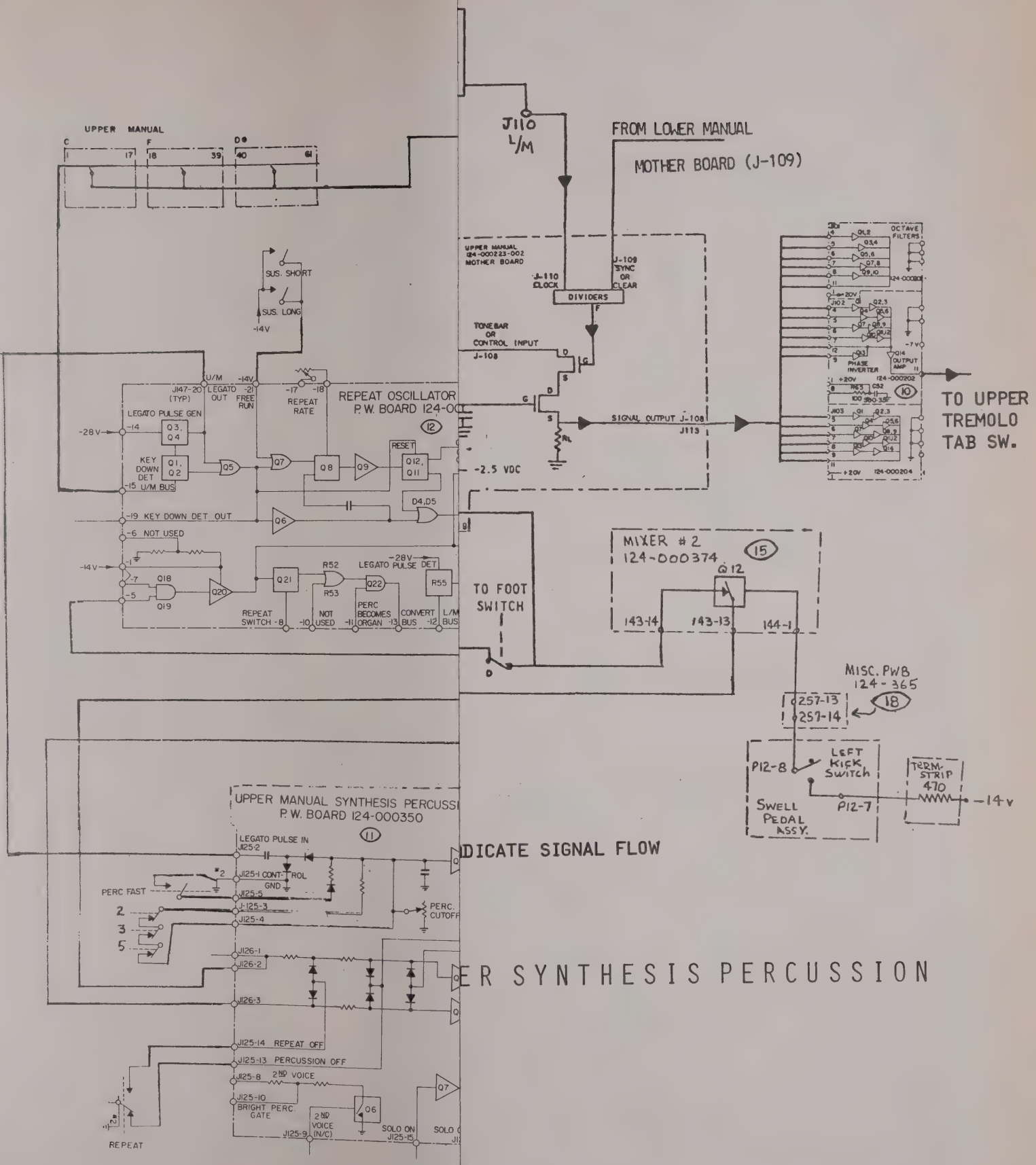


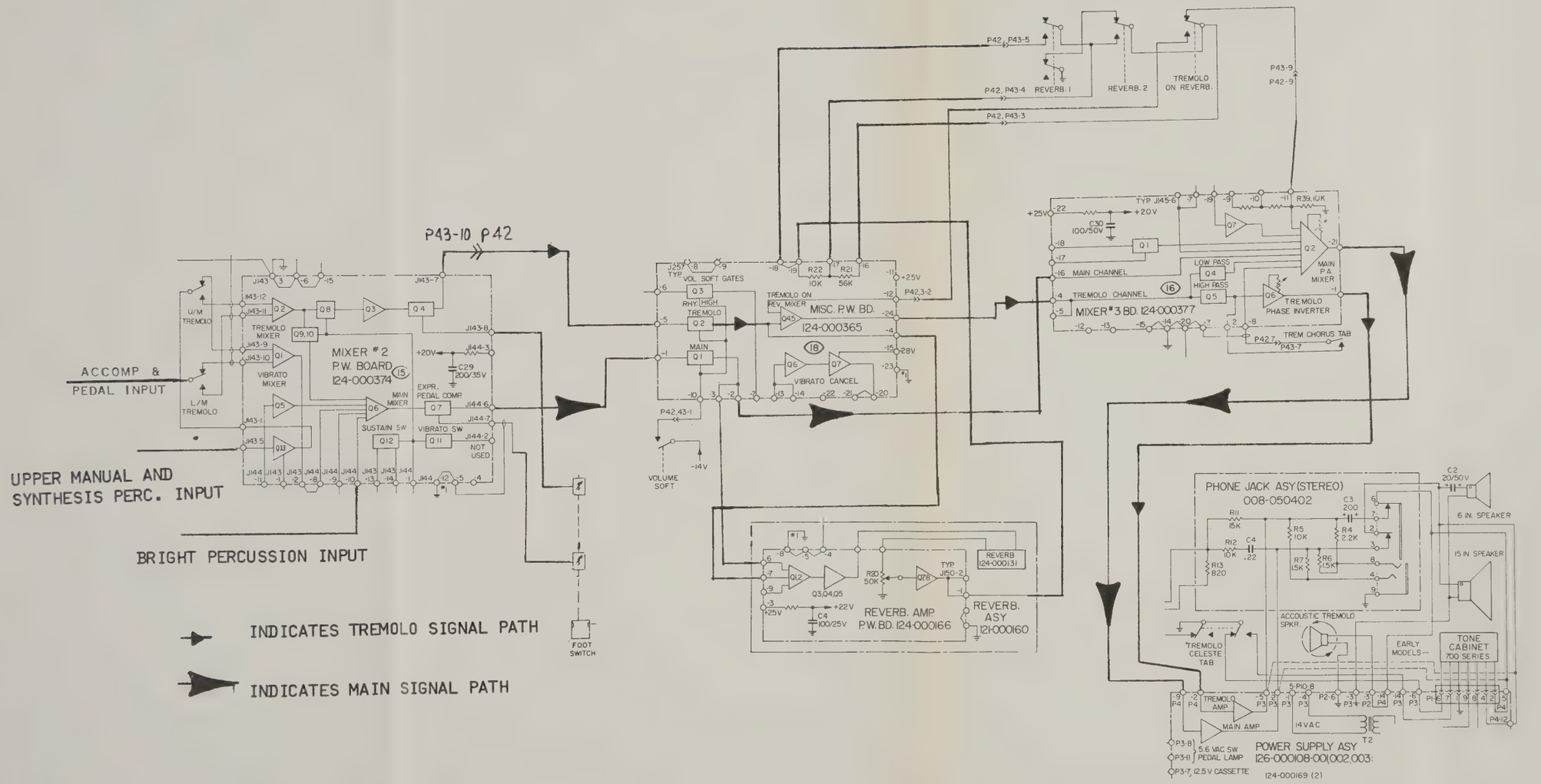
→ ARROWS INDICATE SIGNAL FLOW

UPPER TONEBARS AND PRESETS

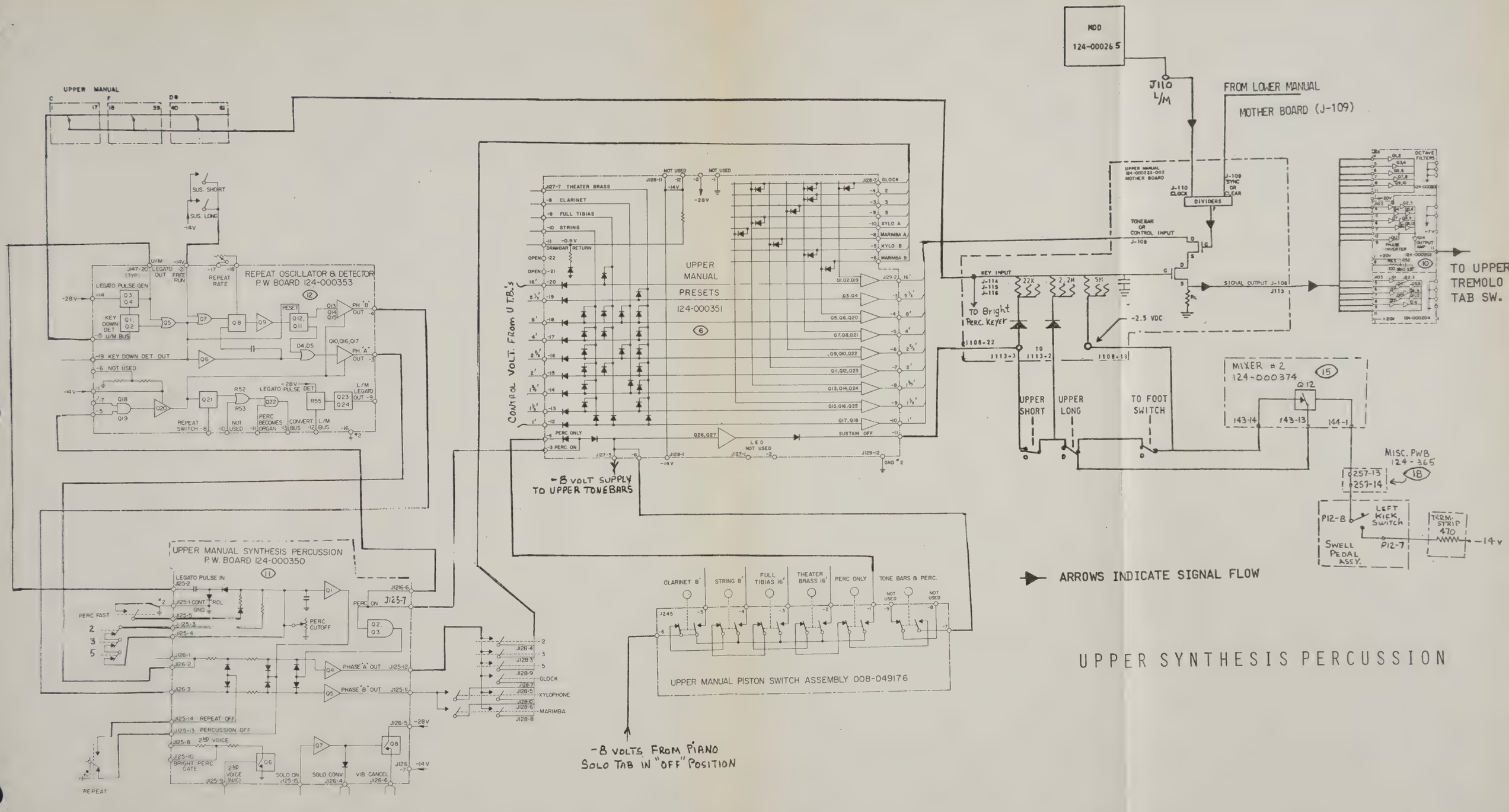


SYSTEM MIXER AND AMPLIFIER

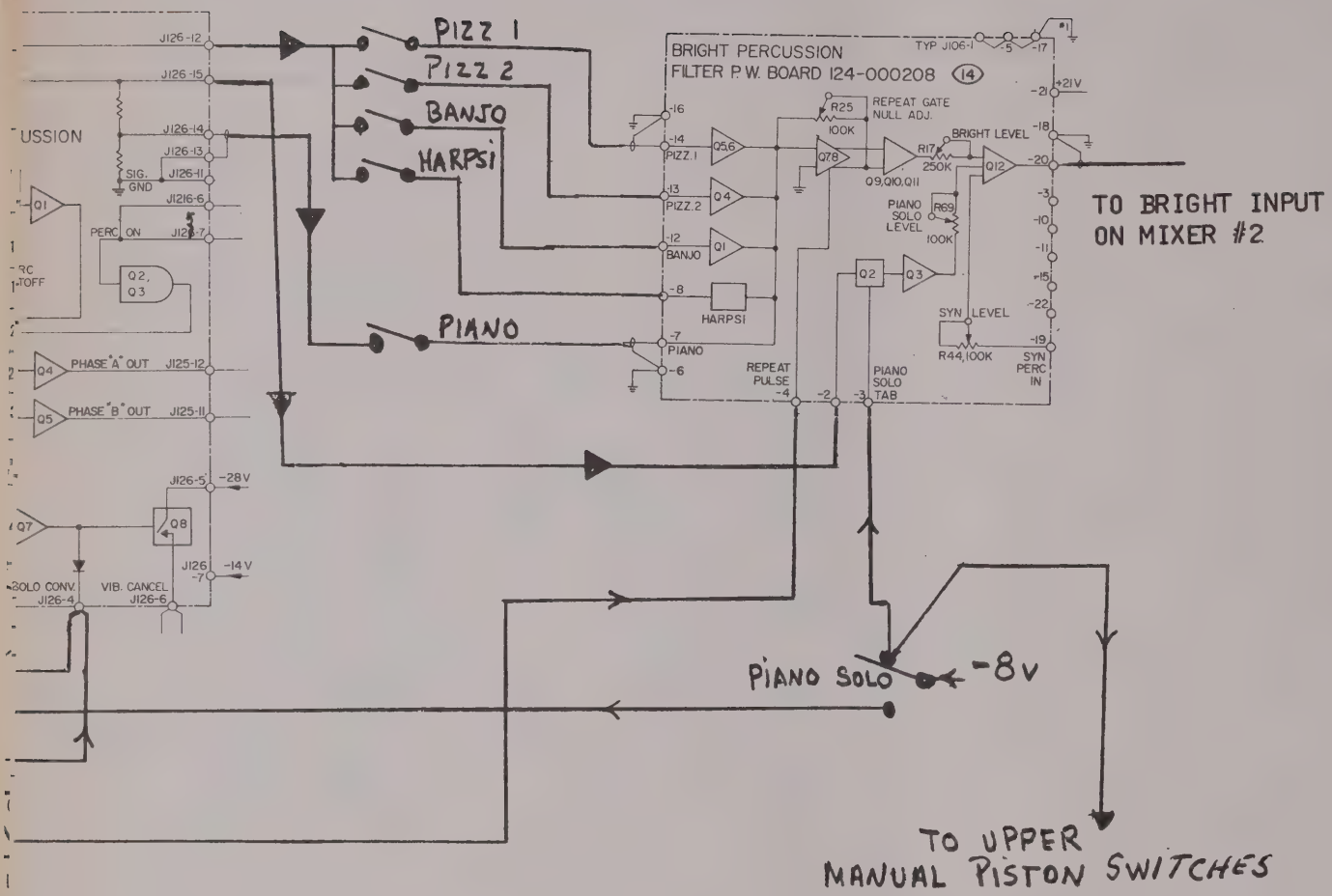

UPPER MANUAL
C
F
D#
1
17
18
39
40
61
J110
L/M
FROM LOWER MANUAL
MOTHER BOARD (J-109)
SUS. SHORT
SUS. LONG
-14V
UPPER MANUAL
124-000223-002
MOTHER BOARD
J-110
CLOCK
J-109
SYNC
OR
CLEAR
DIVIDERS
TONE BAR
OR
CONTROL INPUT
J-108
-2.5 VDC
SIGNAL OUTPUT J-108
J113
OCTAVE
FILTERS
PHASE
INVERTER
OUTPUT
AMP
TO UPPER
TREMOLO
TAB SW.
REPEAT OSCILLATOR
P.W. BOARD 124-00
LEGATO PULSE GEN
KEY
DOWN
DET
U/M BUS
KEY DOWN DET OUT
NOT USED
REPEAT
RATE
RESET
D4,D5
LEGATO PULSE DET
REPEAT
SWITCH
NOT
USED
PERC
BECOMES
ORGAN
CONVERT
BUS
L/M
BUS
TO FOOT
SWITCH
MIXER #2
124-000374
143-14
143-13
144-1
MISC. PWB
124-365
257-13
257-14
LEFT
KICK
SWITCH
P12-8
P12-7
SWELL
PEDAL
ASSY.
TERM.
STRIP
470
-14v
UPPER MANUAL SYNTHESIS PERCUSSI
P.W. BOARD 124-000350
LEGATO PULSE IN
J125-2
J125-1 CONTROL
GND
J125-5
J125-3
J125-4
PERC FAST
PERC.
CUTOFF
J126-1
J126-2
J126-3
J125-14 REPEAT OFF
J125-13 PERCUSSION OFF
J125-8 2ND VOICE
J125-10
BRIGHT PERC.
GATE
2ND
VOICE
(N/C)
J125-9
SOLO ON
J125-15
REPEAT
INDICATE SIGNAL FLOW
ER SYNTHESIS PERCUSSION



SYSTEM MIXER AND AMPLIFIER

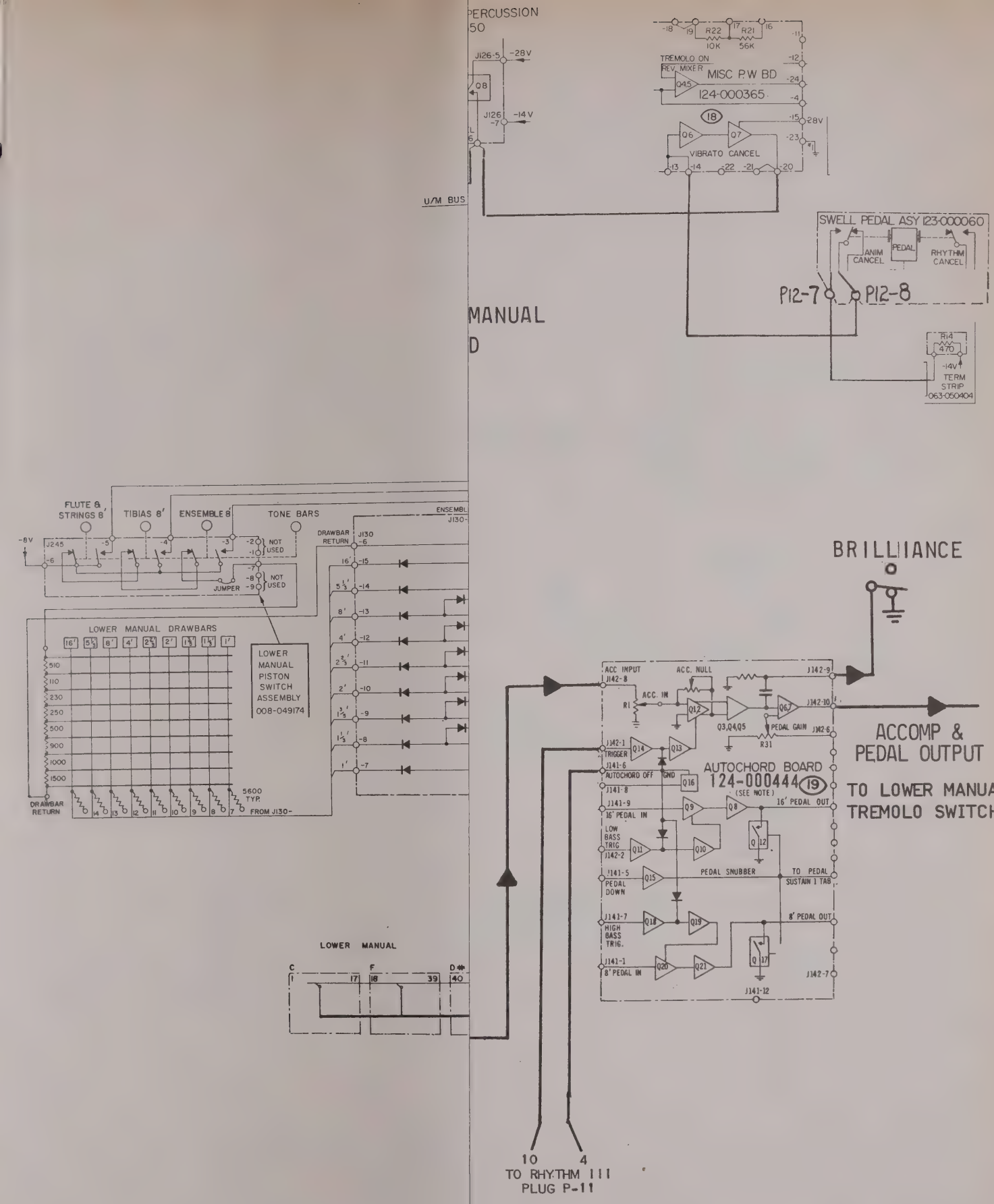


UPPER SYNTHESIS PERCUSSION



ARROWS INDICATE SIGNAL FLOW

BRIGHT PERCUSSION SYSTEM



ER TONEBARS AND PRESETS

VIBRATO CONTROL

-27v KEY DOWN

FROM UPPER MANUAL KEYER INPUT

124-000340

MDD

SYNC

IC 380

J108-3

-14v

-2.5v

CUTOFF

J117-4

J113-4

J113-5

J108-18

BANJO

PIZZ 1

PIZZ 2

PERC FAST

HARPSI

PIANO

PIANO SOLO

UPPER MANUAL SYNTHESIS PERCUSSION P.W. BOARD 124-000350

+25V

+21V

PIANO FILTER

PERC SIGNAL IN

BRIGHT BUS AMP

LEGATO PULSE IN J125-2

J125-1 CONTROL

GND

J125-5 SUS 1

J125-3 SUS 2

J125-4 SUS 3

PERC. CUTOFF

PERC. ON

SIG. GND

PHASE "A" OUT J125-12

PHASE "B" OUT J125-11

J125-14 REPEAT OFF

J125-13 PERCUSSION OFF

J125-8 2ND VOICE

J125-10 BRIGHT PERC. GATE

2ND VOICE (N/C) J125-9

SOLO ON J125-15

SOLO CONV J126-4

VIB CANCEL J126-6

-28V

-14V

PIZZ 1

PIZZ 2

BANJO

HARPSI

PIANO

BRIGHT PERCUSSION FILTER P.W. BOARD 124-000208

TYP J106-1

REPEAT GATE NULL ADJ

BRIGHT LEVEL

PIANO SOLO LEVEL

SYN LEVEL

REPEAT PULSE

PIANO SOLO TAB

SYN PERC IN

TO BRIGHT INPUT ON MIXER #2

REPEAT

2nd Voice

PIANO SOLO

-8v

TO UPPER MANUAL PISTON SWITCHES

UPPER MANUAL

REPEAT OSCILLATOR & DETECTOR P.W. BOARD 124-000353

LEGATO PULSE GEN

KEY DOWN DET

U/M BUS

KEY DOWN DET. OUT

NOT USED

REPEAT RATE

REPEAT SWITCH

NOT USED

PERC BECOMES ORGAN

CONVERT BUS

L/M BUS

PH "A" OUT

PH "B" OUT

LEGATO PULSE DET

L/M LEGATO OUT

2ND Voice

ARROWS INDICATE SIGNAL FLOW

BRIGHT PERCUSSION SYSTEM

REPEAT OSCILLATOR & DETECTOR
P.W. BOARD 124-000353
(12)

DELAY VIBRATO

TO UPPER MANUAL & PERCUSSION KEYERS

124-000265 (1)
MDD GENERATOR BOARD

UPPER MANUAL SYNTHESIS PERCUSSION
P.W. BOARD 124-000350
(11)

MISC P.W. BD.
124-000365
(18)

SWELL PEDAL ASY 123-000060

FROM LOWER MANUAL MOTHER BOARD

ARPEGGIATOR KEYING STRIP

ARPEGGIATOR PWB
124-047850

LOWER MANUAL
124-000223
MOTHER BOARD

J-110 CLOCK

J-109 SYNC OR CLEAR

DIVIDERS

TONEBAR OR CONTROL INPUT J-106

J-117

MANUAL KEY INPUT
J-114
J-115
J-116

100K

1M

5.6M

SIGNAL OUTPUT J-108
J113

BRILLIANCE

ACCOMP & PEDAL OUTPUT

TO LOWER MANUAL TREMOLO SWITCH

AUTOCHORD BOARD
124-000444 (19)
(SEE NOTE)

PEDAL TO LOWER

FROM PEDAL KEYER INPUT

FLUTE 8' STRINGS 8' | TIBIAS 8' | ENSEMBLE 8' | TONE BARS

LOWER MANUAL DRAWBARS

LOWER MANUAL PISTON SWITCH ASSEMBLY
008-049174

LOWER MANUAL PRESETS
124-000352
(7)

LOWER MANUAL

REPEAT OSCILLATOR & DETECTOR
P.W. BOARD 124-000353
(12)

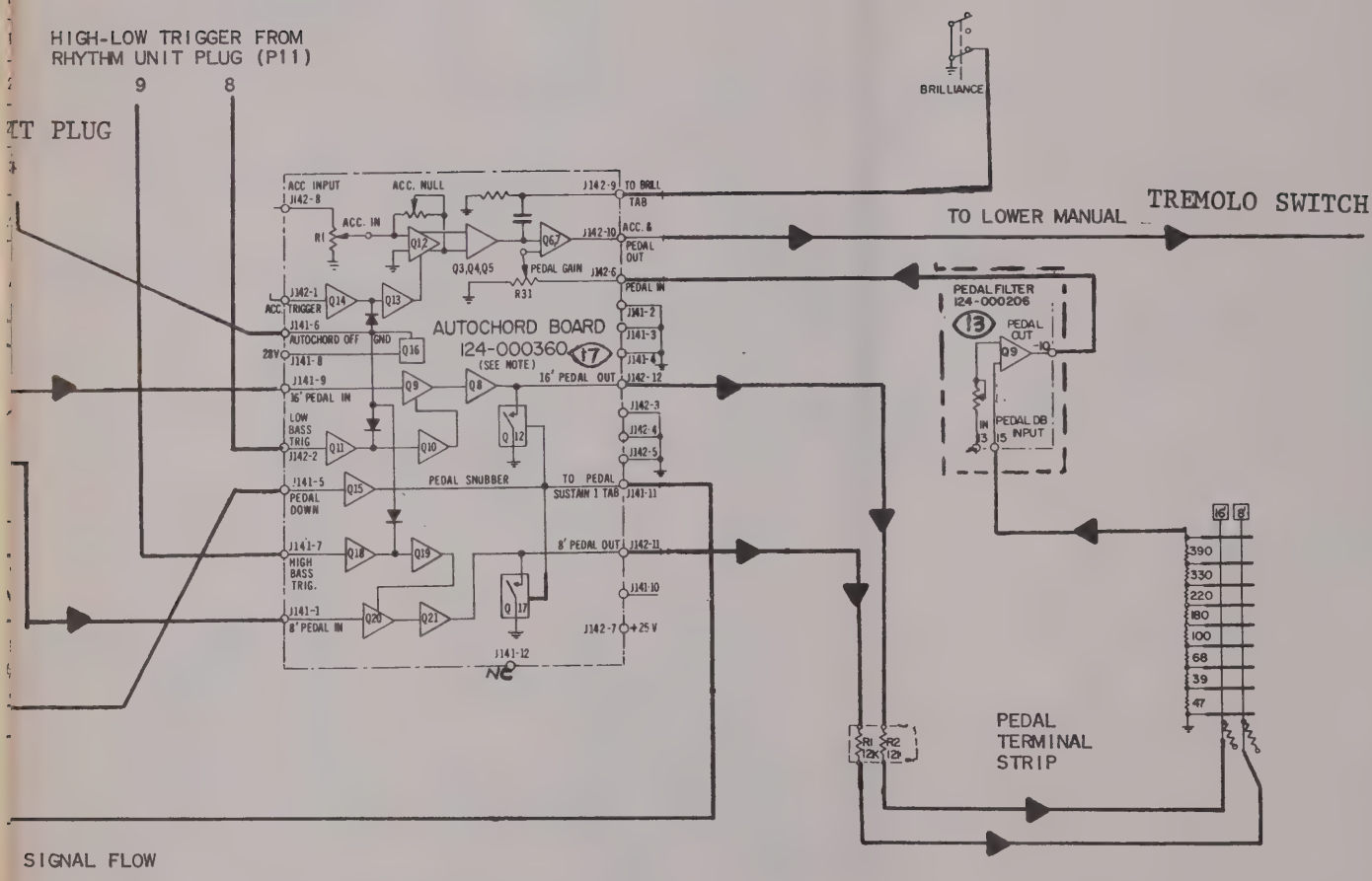
TO RHYTHM III PLUG P-11, PIN 6

10 4
TO RHYTHM III PLUG P-11

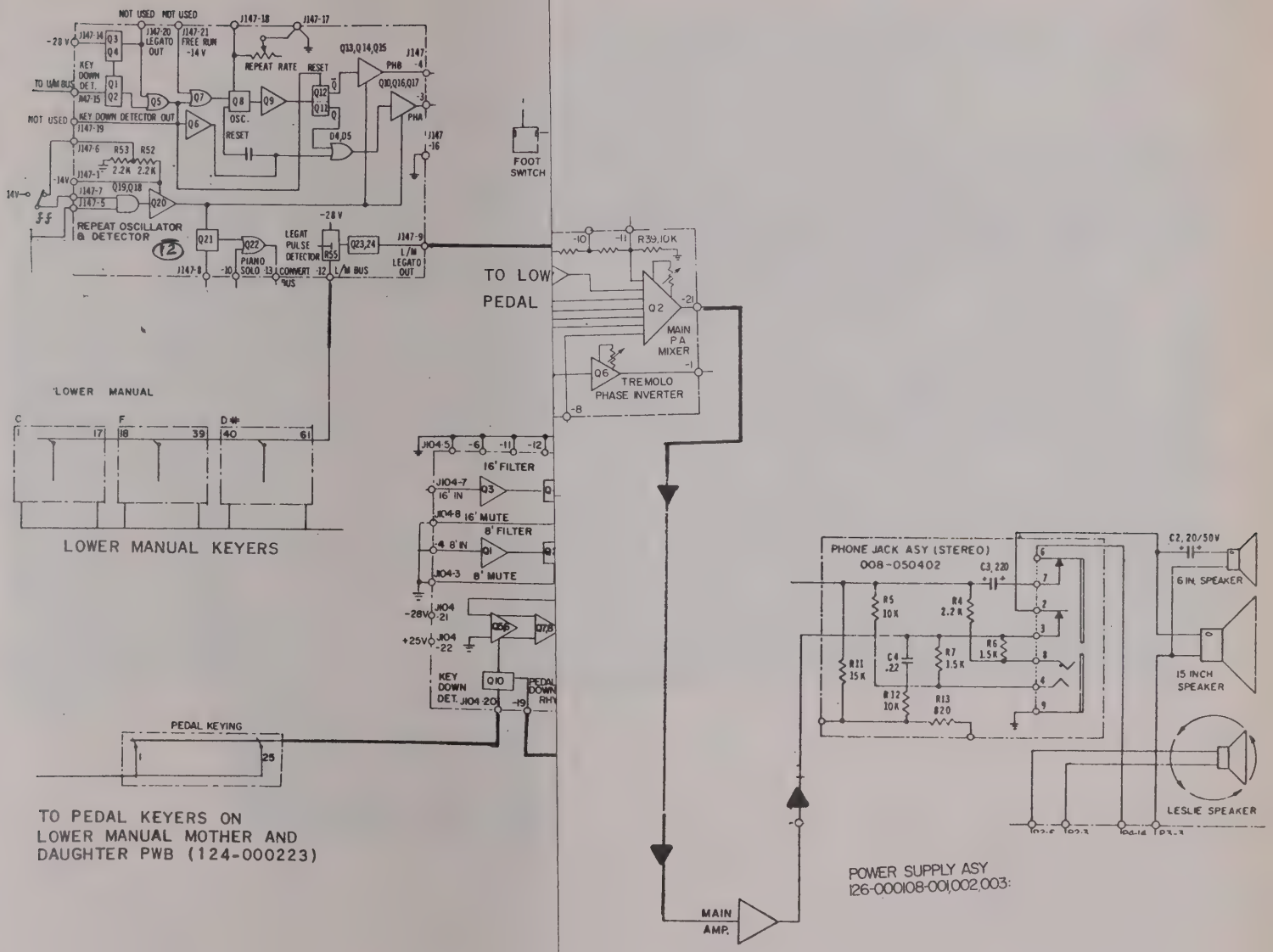
ARROWS INDICATE SIGNAL PATH

LOWER TONEBARS AND PRESETS

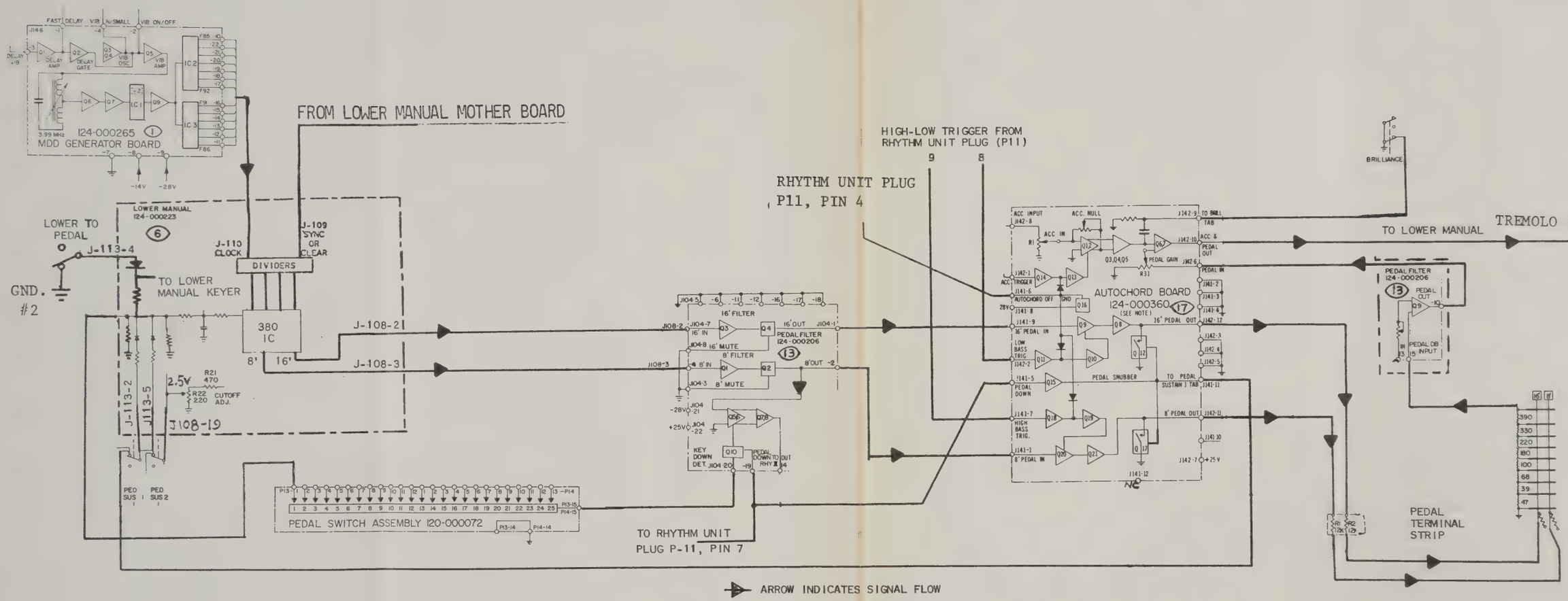
VIBRATO CONTROL



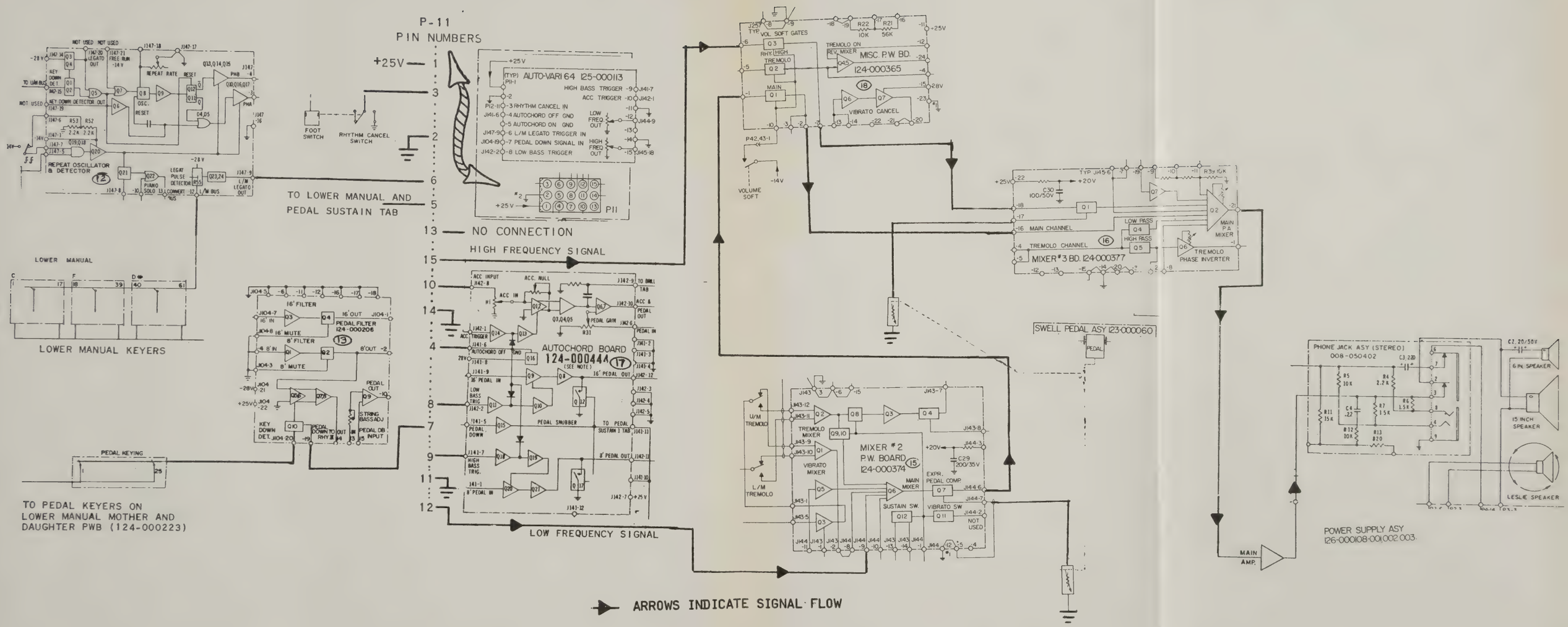
PEDAL TONEBARS



ND ASSOCIATED CIRCUITRY

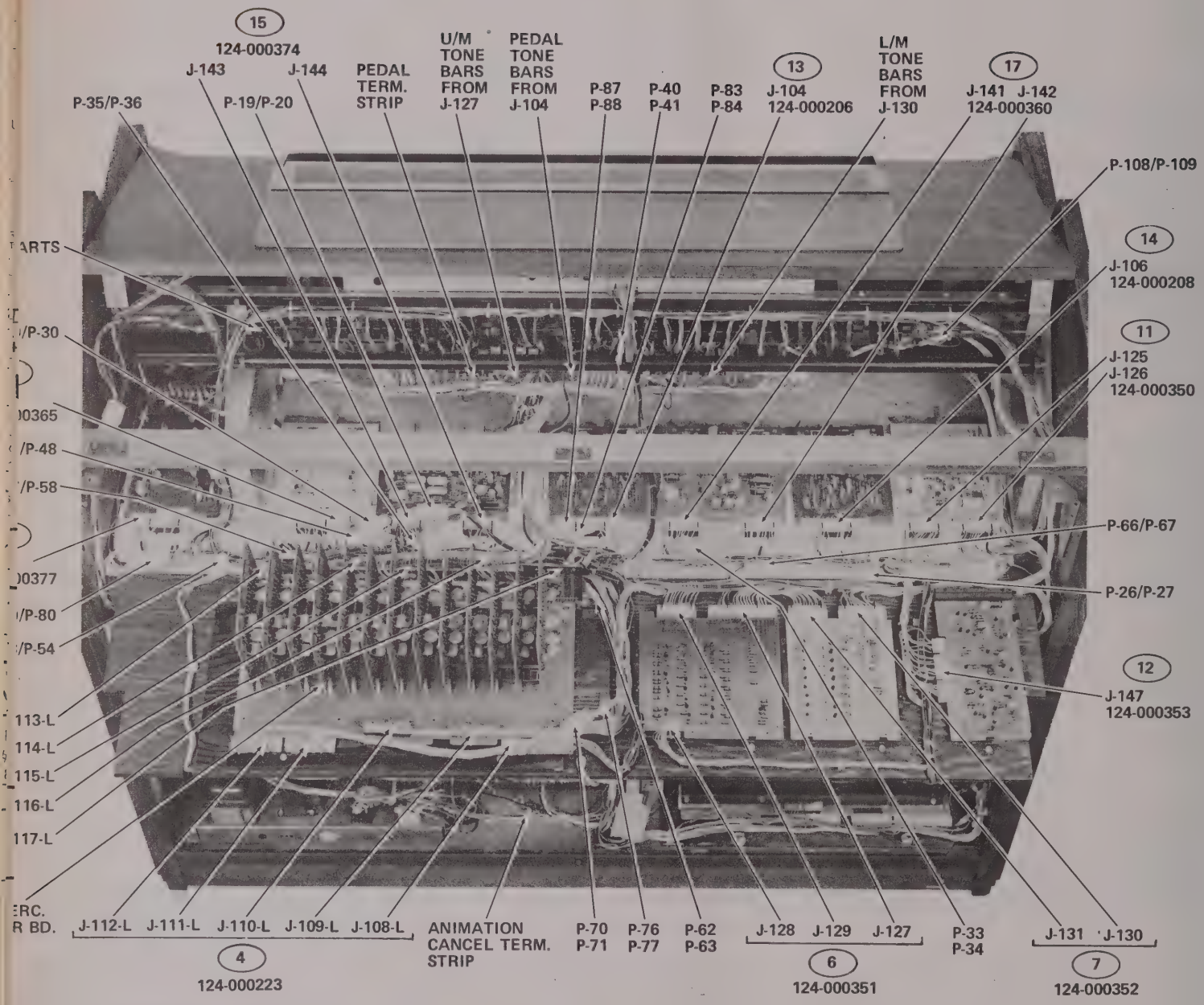


PEDAL TONEBARS

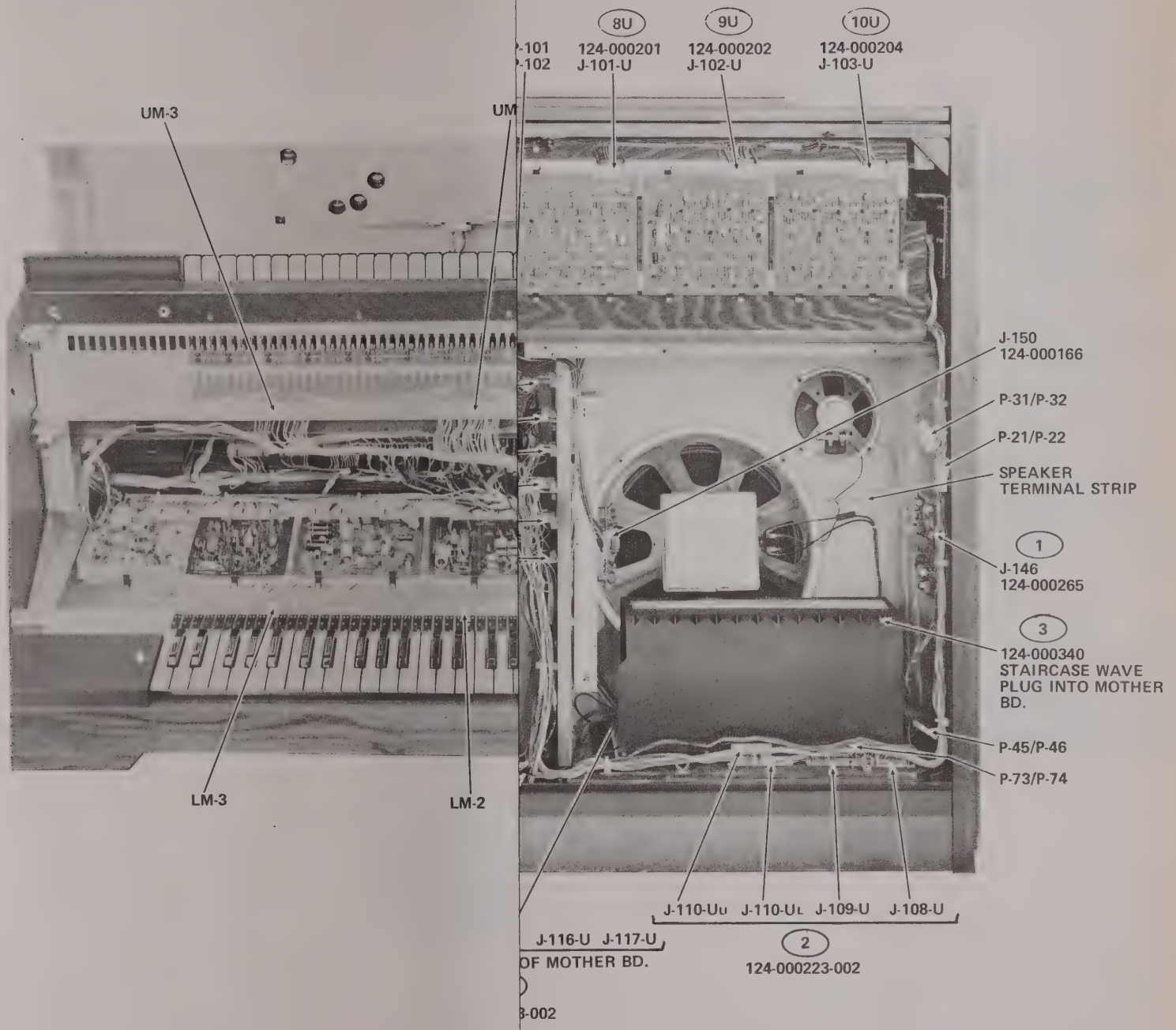


RHYTHM AND ASSOCIATED CIRCUITRY

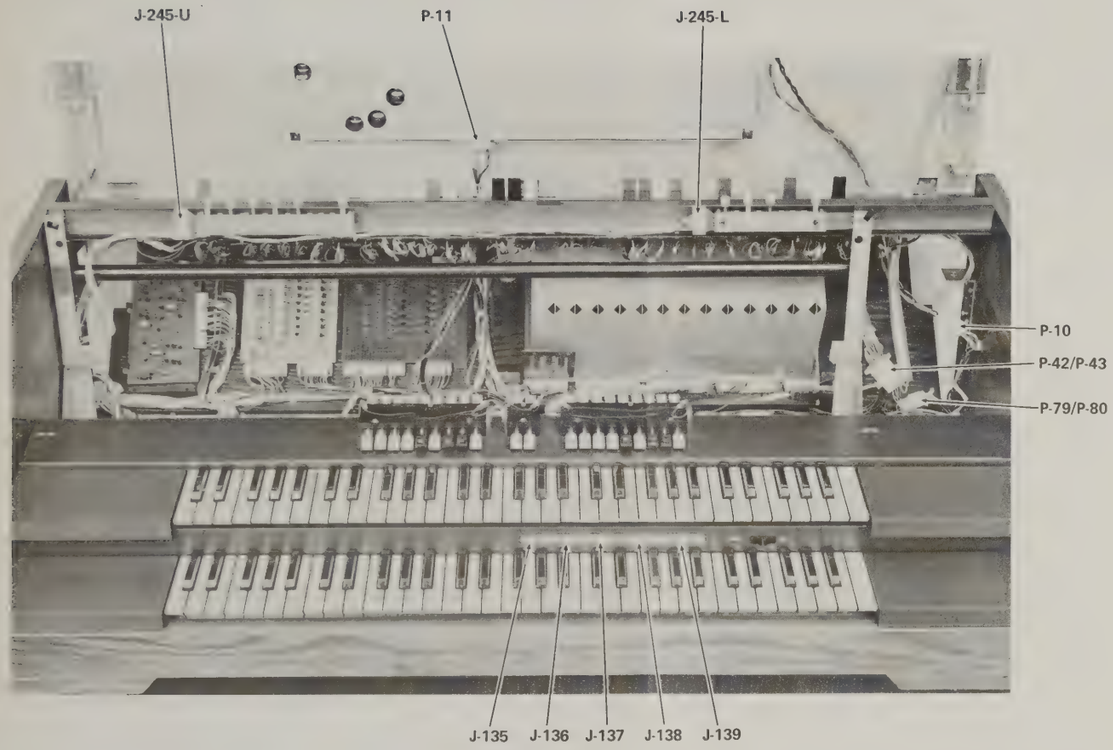
SERIES CONSOLE ORGAN

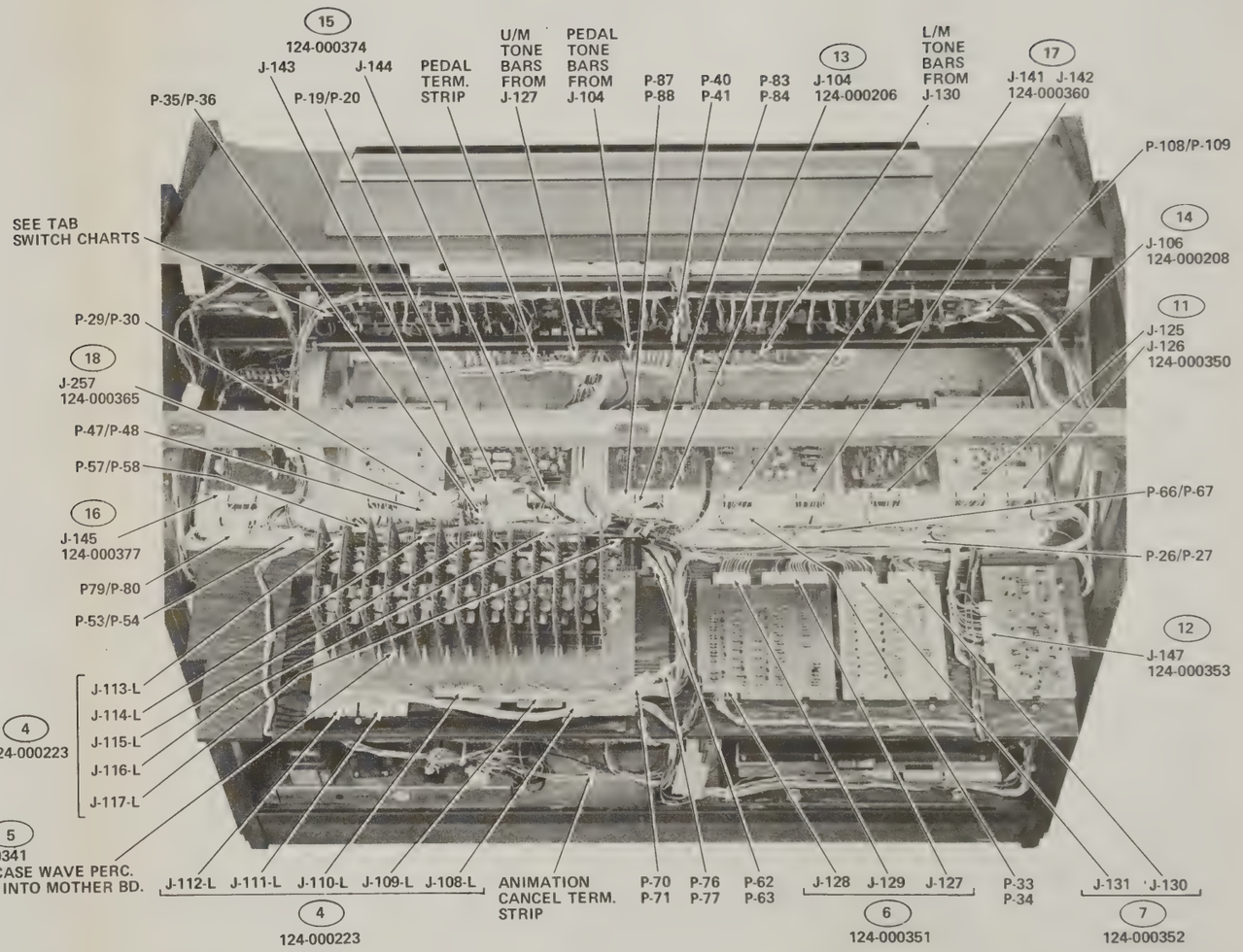


PLUG

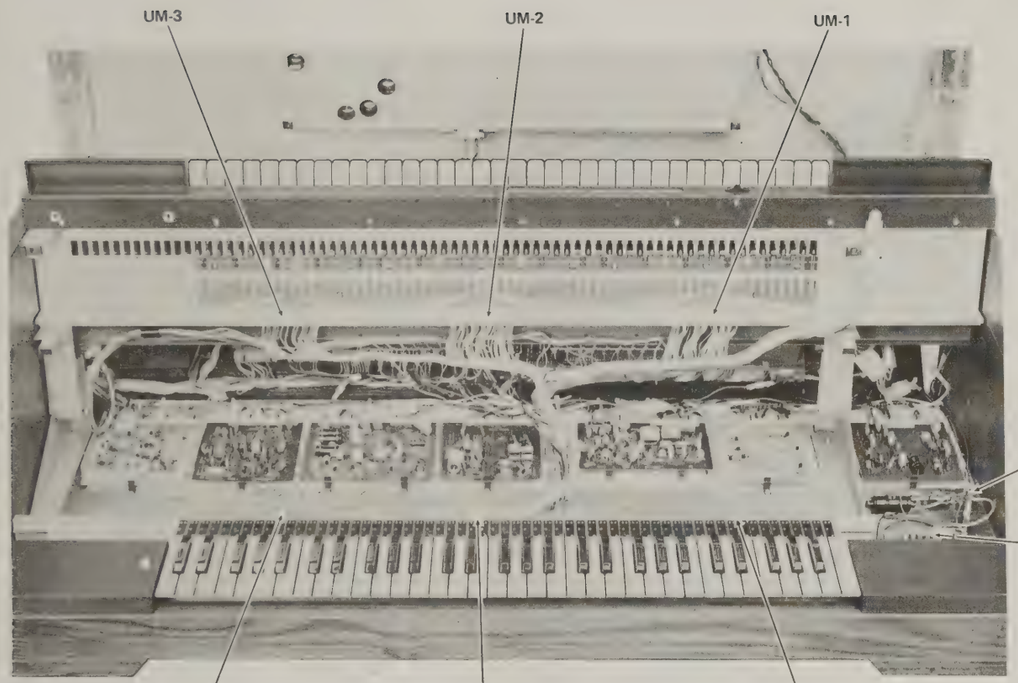

8U
9U
10U
124-000201
J-101-U
124-000202
J-102-U
124-000204
J-103-U
UM-3
UM
J-150
124-000166
P-31/P-32
P-21/P-22
SPEAKER
TERMINAL STRIP
1
J-146
124-000265
3
124-000340
STAIRCASE WAVE
PLUG INTO MOTHER
BD.
P-45/P-46
P-73/P-74
LM-3
LM-2
J-110-Uu
J-110-UL
J-109-U
J-108-U
J-116-U J-117-U
OF MOTHER BD.
2
124-000223-002

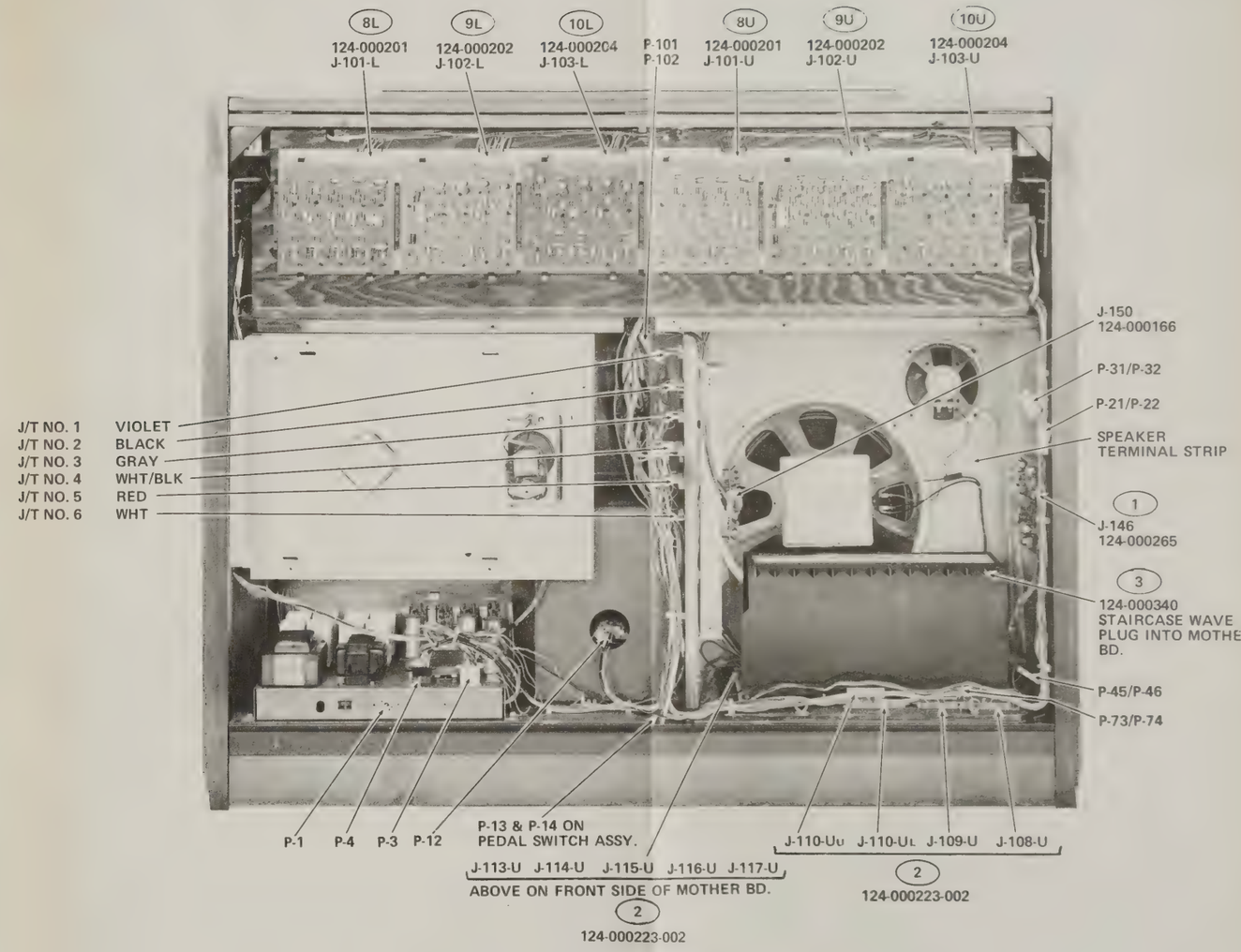
PLUG & CONNECTOR LOCATION OF 11100 SERIES CONSOLE ORGAN



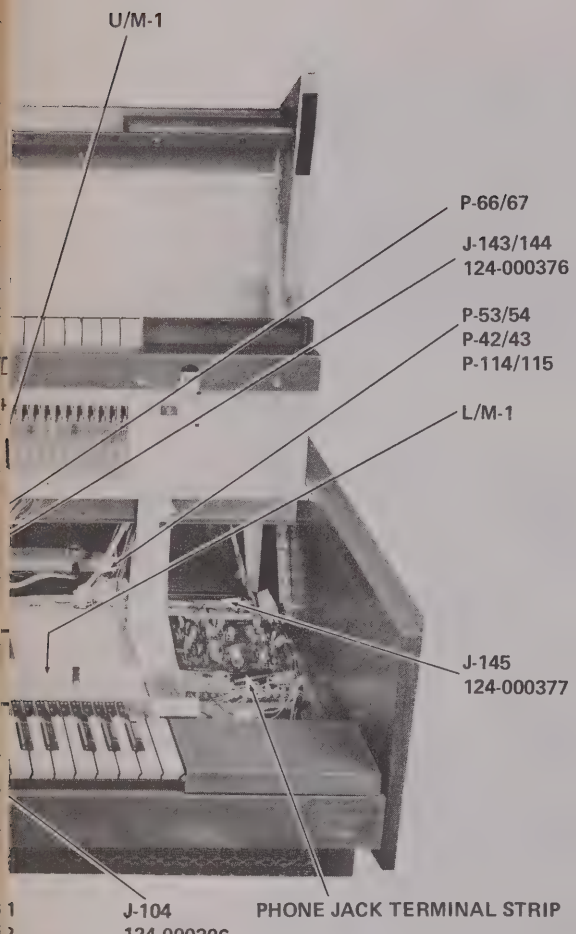


PLUG & CONNECTOR LOCATION OF 11100 SERIES CONSOLE ORGAN

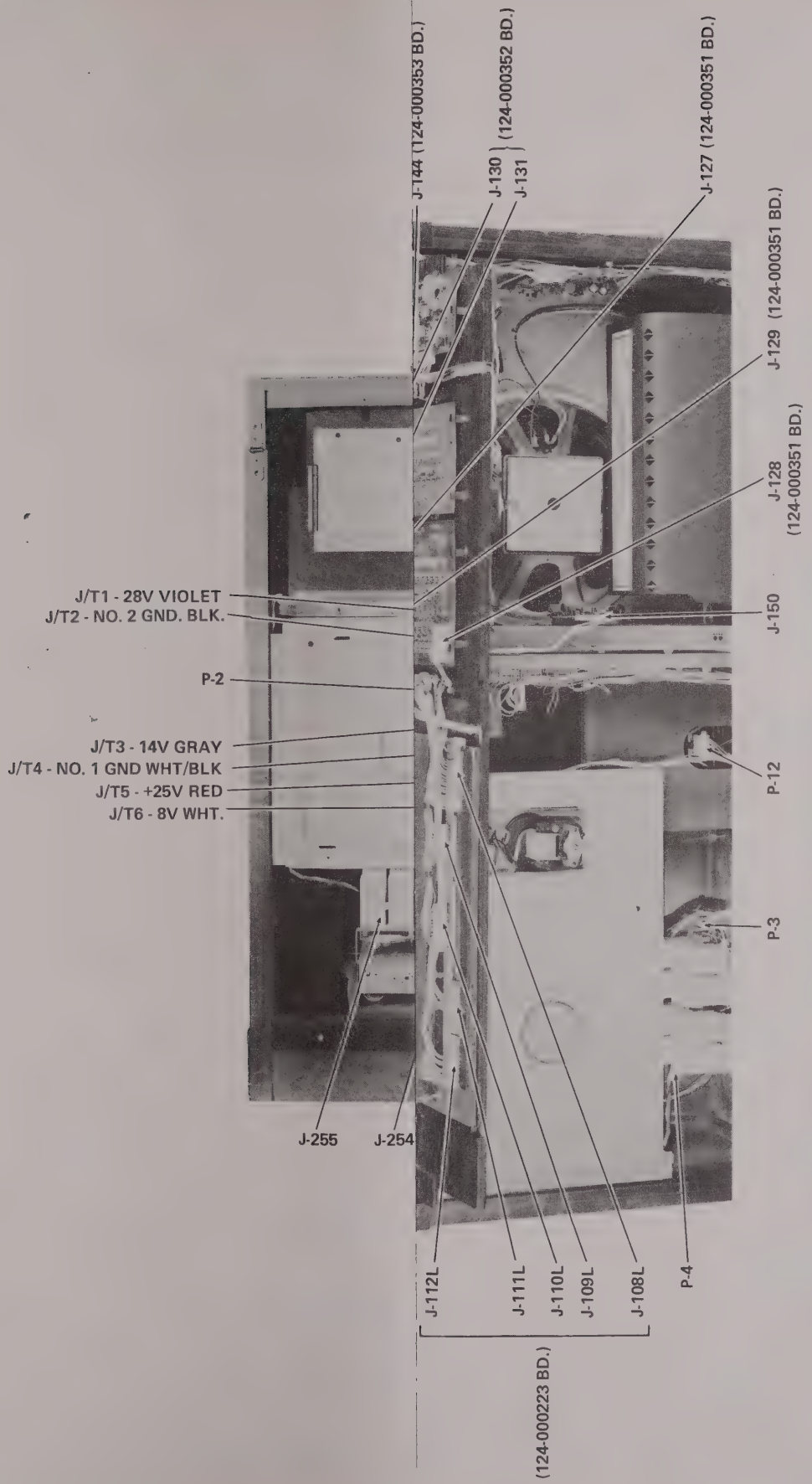




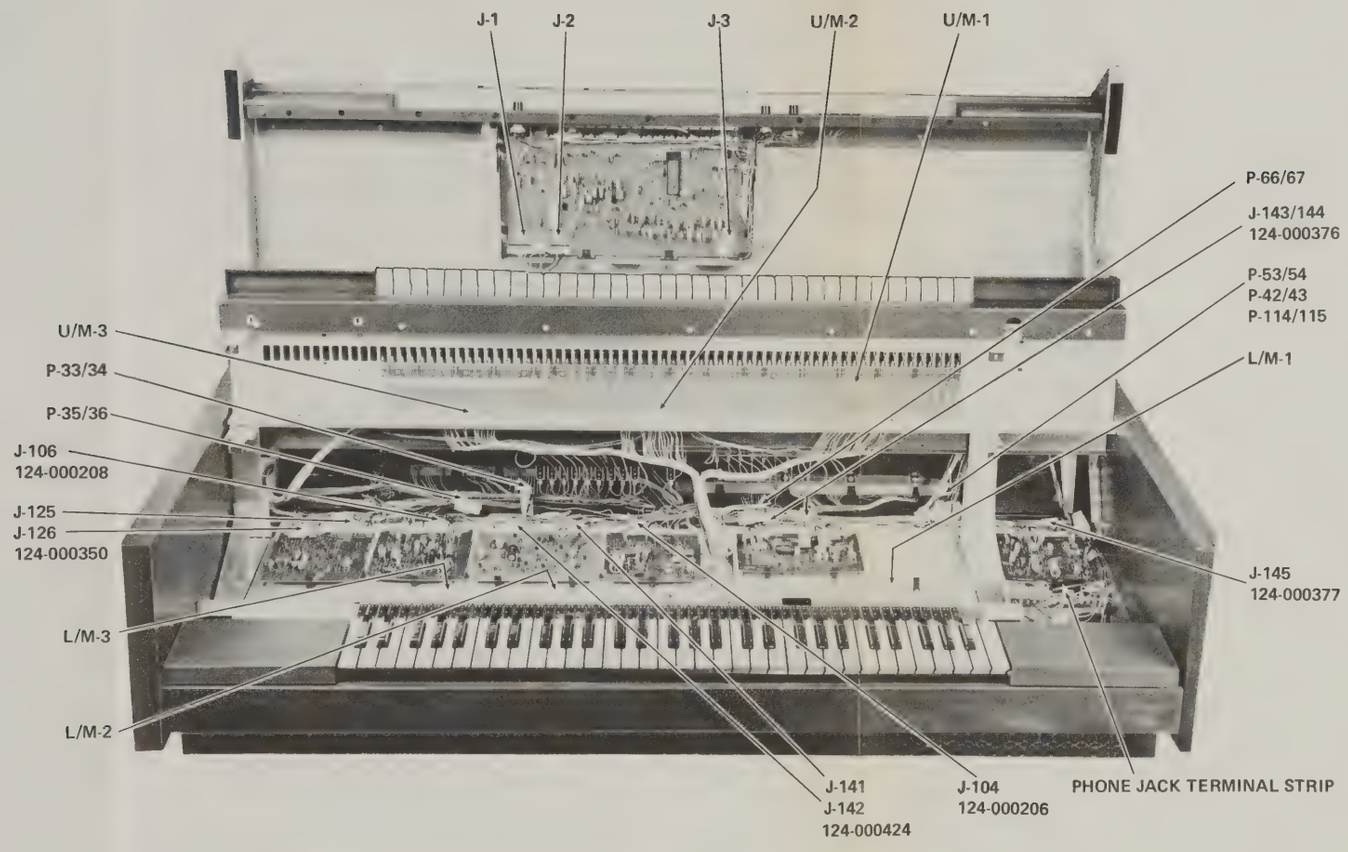
SERIES CONSOLE ORGAN



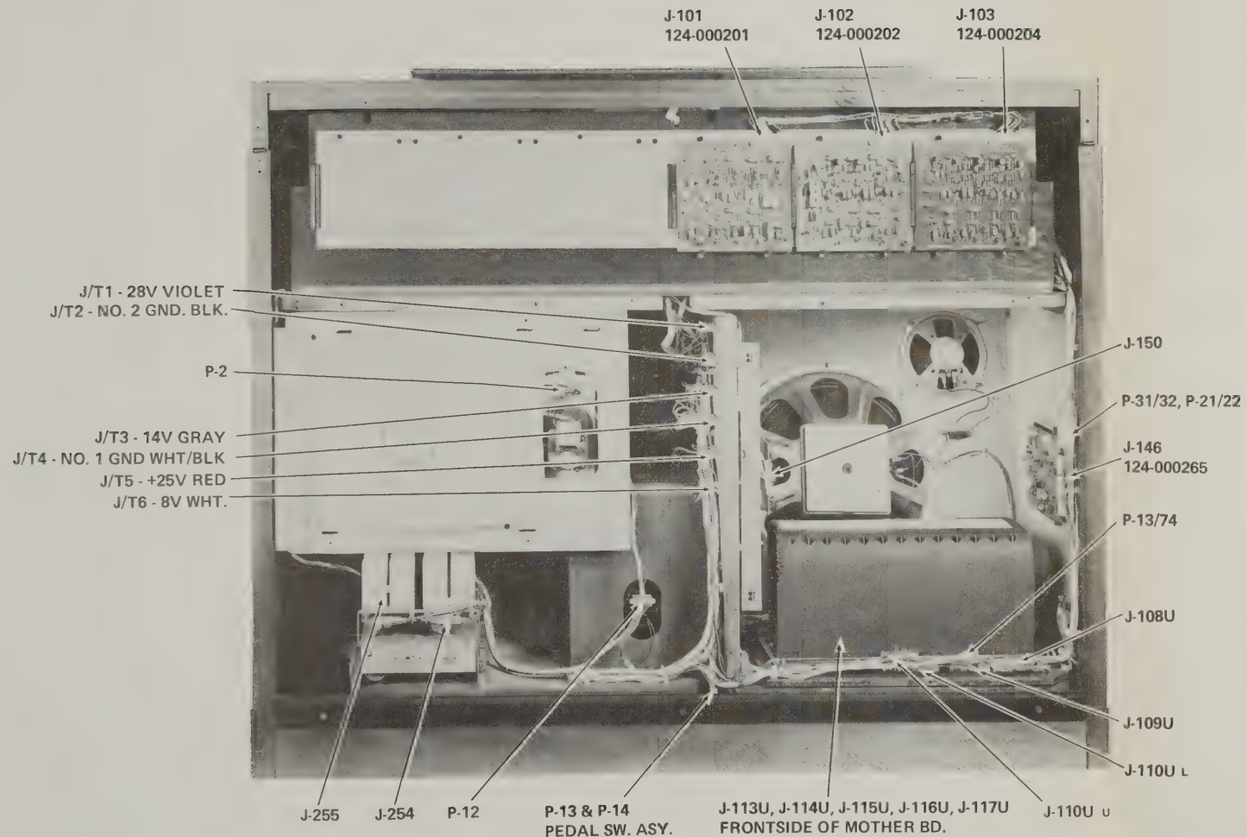
1
2
00424

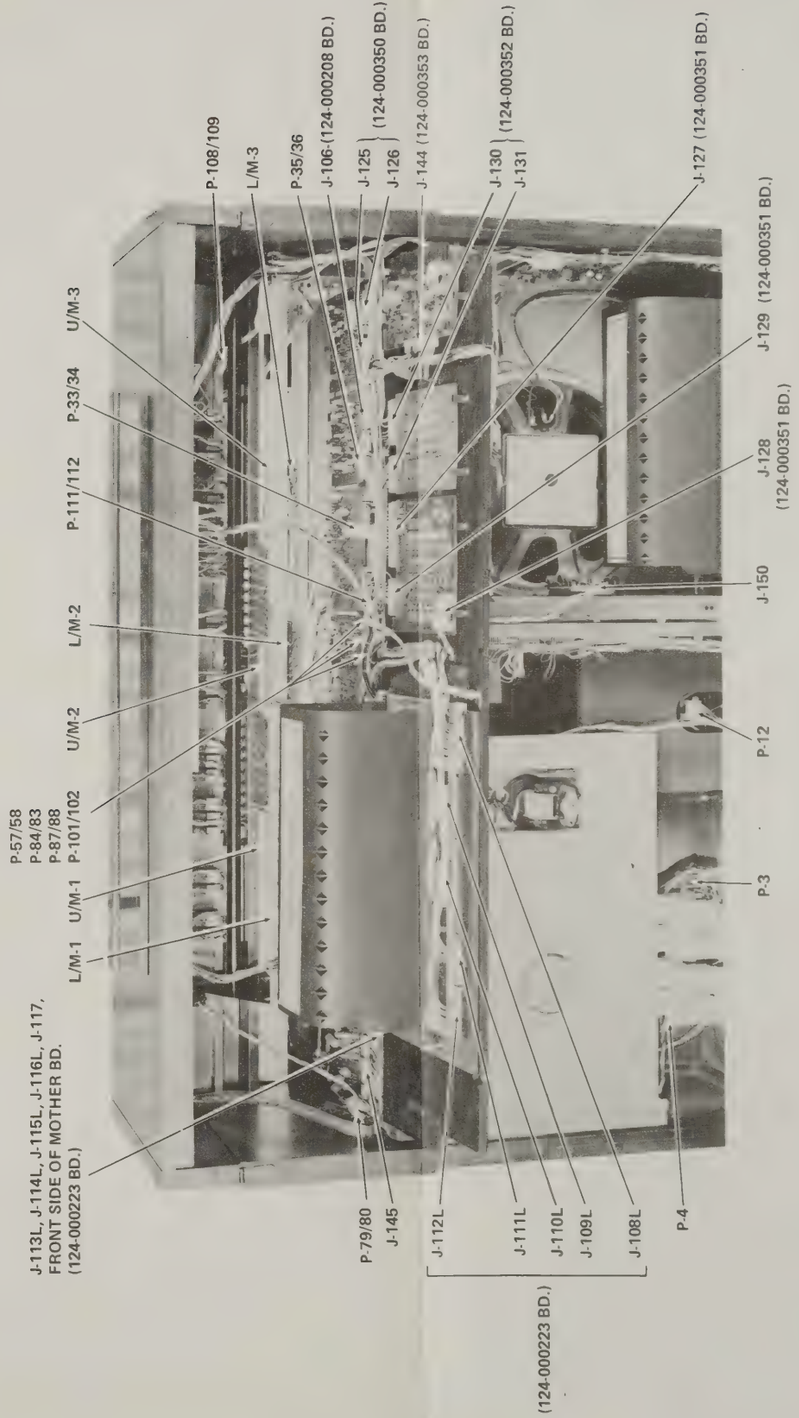

J-144 (124-000353 BD.)
J-130
J-131
(124-000352 BD.)
J-127 (124-000351 BD.)
J-129 (124-000351 BD.)
J-128 (124-000351 BD.)
J-150
P-12
P-3
P-4
J/T1 - 28V VIOLET
J/T2 - NO. 2 GND. BLK.
P-2
J/T3 - 14V GRAY
J/T4 - NO. 1 GND WHT/BLK
J/T5 - +25V RED
J/T6 - 8V WHT.
J-255
J-254
J-112L
J-111L
J-110L
J-109L
J-108L
(124-000223 BD.)

PLUG & CONNECTOR LOCATION OF 16100 SERIES CONSOLE ORGAN



PLUG & CONNECTOR LOCATION OF 16100 SERIES CONSOLE ORGAN





D

3-1. GENERAL.– This section co
necessary to proper organ s

LIST
11,0

FIGURE

LIST OF ILLUSTRATIONS (1

3- 1 11,000 SERIES CONSOLE LO

3- 2 11,000 SERIES CONSOLE LO

3- 3 11,000 SERIES CONSOLE BL

3- 4 MDD GENERATOR BOARD.....
Schematic, Layout and Th

3- 5 UPPER MANUAL SYNTHESIS M
Schematic, Layout and Th

3- 6 STAIRCASE WAVE PERCUSSIO
Schematic, Layout and Th

3- 7 LOWER MANUAL SYNTHESIS D
Schematic, Layout and Th

3- 8 LOWER MANUAL SYNTHESIS D
Schematic, Layout and Th

3- 9 UPPER MANUAL PRE-SETS BO
Schematic and Layout

3-10 LOWER MANUAL PRESETS BOA
Schematic and Layout

3-11 I.C. 380 DIVIDER KEYER P
Schematic

3-12 SINE WAVE FILTER #1 Boar
Schematic, Layout and Th

3-13 SINE WAVE FILTER #2 Boar
Schematic and Layout

3-14 SINE WAVE FILTER #3 Boar
Schematic and Layout

3-15 UPPER MANUAL SYNTHESIS P
Schematic and Layout

3-16 REPEAT OSCILLATOR AND DE
Schematic and Layout

3-17 PEDAL FILTER BOARD.....
Schematic, Layout and TH

USTRATIONS
NUED)

SERIES		PAGE
.....(124-000208)	(14)	3-19
(124-000374)	(15)	3-20
(124-000377)	(16)	3-21
.... (124-000444)	(17)	3-22
ard. heory.(124-000365)	(18)	3-23
heory(124-047850)		3-24
heory(124-000166)		3-25
t....(126-000108-001 THRU 003)		3-26
out..(124-000355).....		3-27
.... (124-000354).....		3-27
heory(124-000169).....		3-28
.....		3-30
on...(SHEET 1 OF 2)		3-31
on.. (SHEET 2 OF 2)		3-32
out..(124-000379)		3-33
.....(124-000380)		3-34
.....(124-000418)		3-35
.....		3-36
- Terminal Strips, l Strips.....		3-37
and		3-38
.....(P-1 THRU 27)		3-39
..... (P-29 THRU 80)		3-40
.....		
.....(P-83 THRU J-108U)		3-41
.....(J108L THRU J115)		3-42
.....(J115 THRU J136)		3-43
.....(J137 THRU J257)		3-44

SECTION III
DIAGRAMS AND TEXT

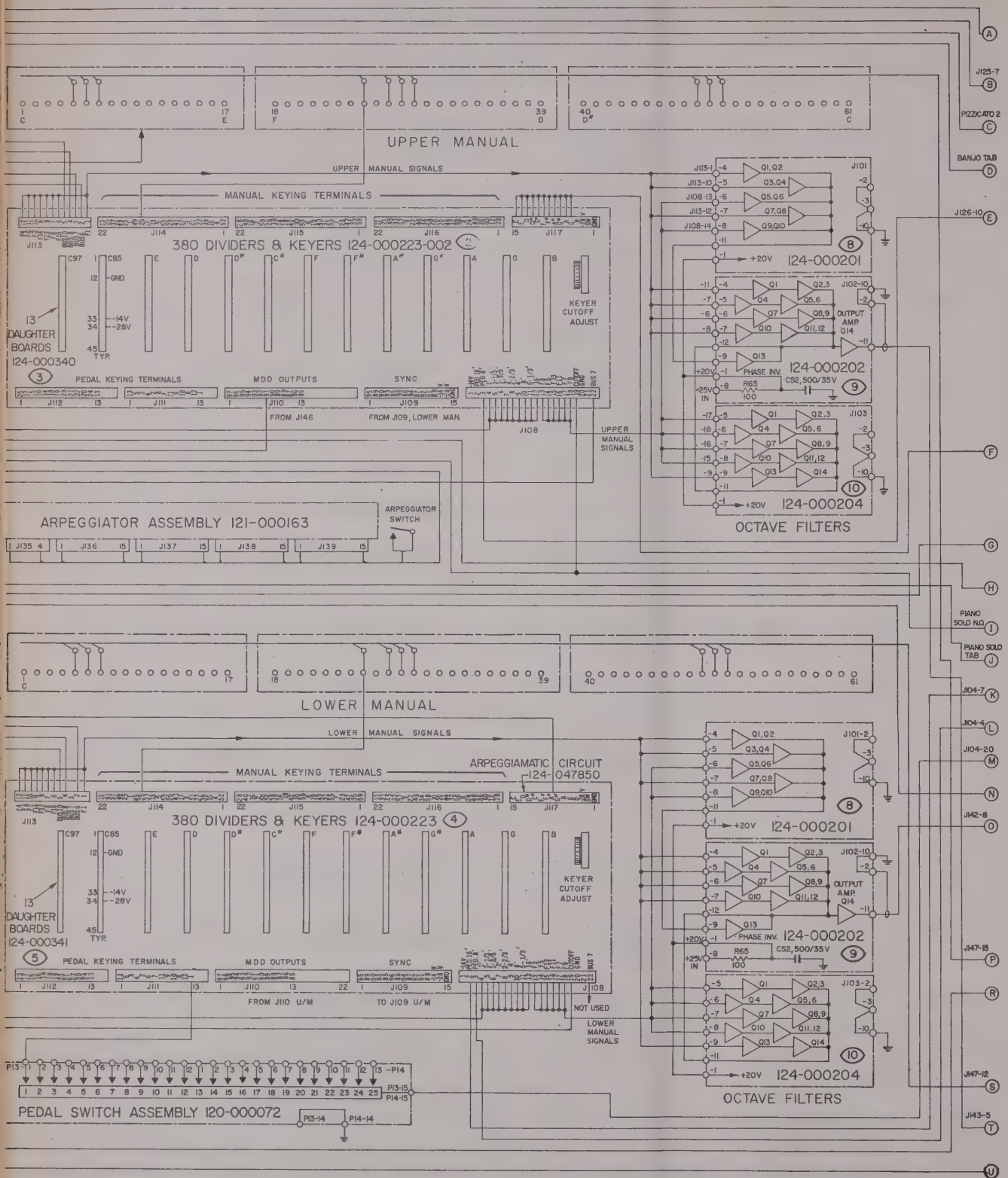
3-1. **GENERAL.**– This section contains schematic diagrams and text to illustrate and provide information necessary to proper organ servicing.

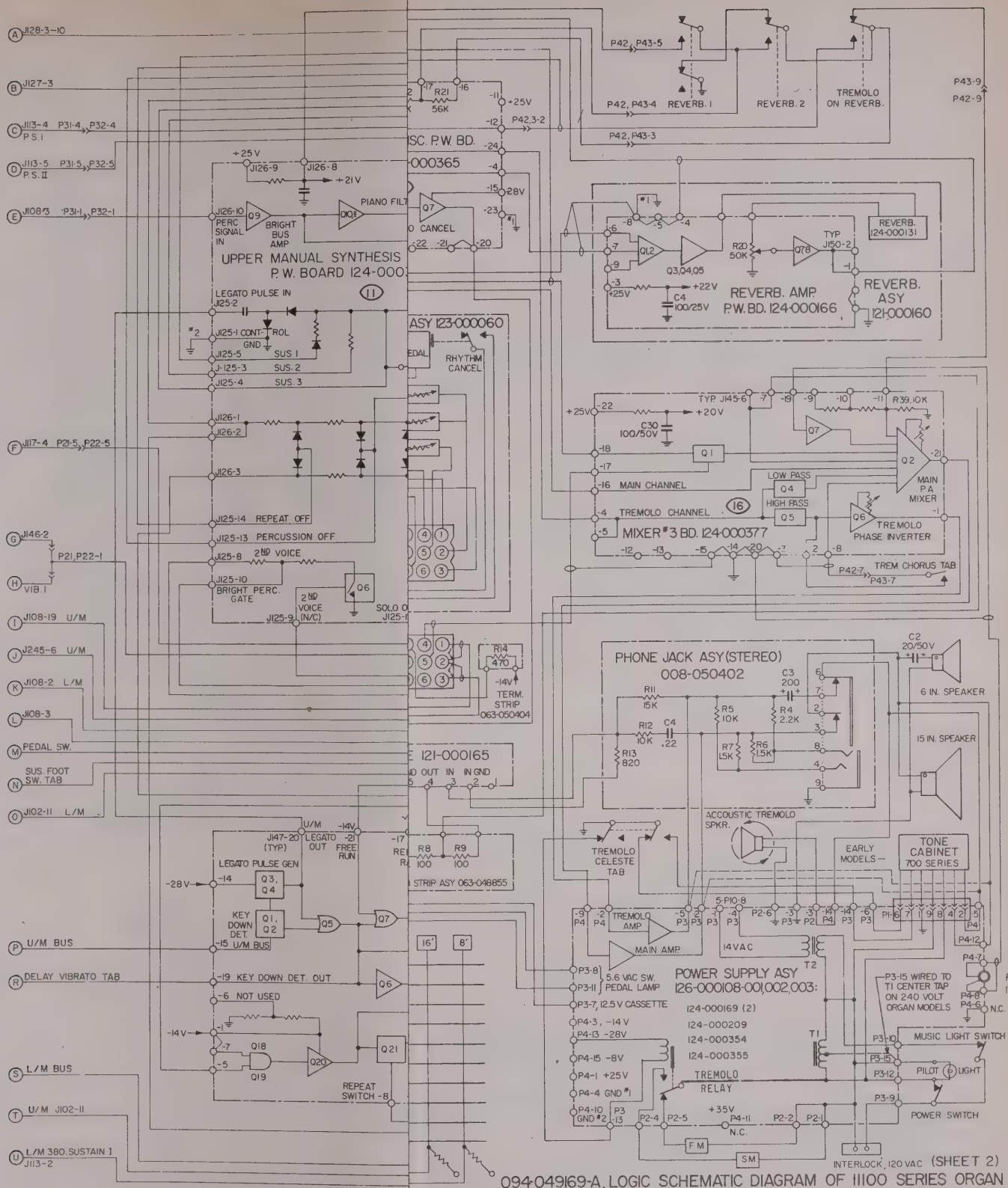
LIST OF ILLUSTRATIONS
11,000 SERIES-GRANDEE

FIGURE				PAGE
	LIST OF ILLUSTRATIONS (11,000 SERIES)			3-1
3-1	11,000 SERIES CONSOLE LOGIC DIAGRAM	(SHEET 1 OF 2)		3-2
3-2	11,000 SERIES CONSOLE LOGIC DIAGRAM	(SHEET 2)F 2)		3-3
3-3	11,000 SERIES CONSOLE BLOCK DIAGRAM			3-4
3-4	MDD GENERATOR BOARD Schematic, Layout and Theory	(124-000265)	(1)	3-5
3-5	UPPER MANUAL SYNTHESIS MOTHER BOARD Schematic, Layout and Theory	(124-000223-002)	(2)	3-6
3-6	STAIRCASE WAVE PERCUSSION BOARD Schematic, Layout and Theory	(124-000340)	(3)	3-7
3-7	LOWER MANUAL SYNTHESIS DAUGHTER BOARD Schematic, Layout and Theory	(124-000223)	(4)	3-8
3-8	LOWER MANUAL SYNTHESIS DAUGHTER BOARD Schematic, Layout and Theory	(124-000341)	(5)	3-9
3-9	UPPER MANUAL PRE-SETS BOARD Schematic and Layout	(124-000351)	(6)	3-10
3-10	LOWER MANUAL PRESETS BOARD Schematic and Layout	(124-000352)	(7)	3-11
3-11	I.C. 380 DIVIDER KEYER PACKAGE Schematic	(075-000380)	(8)	3-12
3-12	SINE WAVE FILTER #1 Board Schematic, Layout and Theory	(124-000201)	(8)	3-13
3-13	SINE WAVE FILTER #2 Board Schematic and Layout	(124-000202)	(9)	3-14
3-14	SINE WAVE FILTER #3 Board Schematic and Layout	(124-000204)	(10)	3-15
3-15	UPPER MANUAL SYNTHESIS PERCUSSION BOARD Schematic and Layout	(124-000350)	(11)	3-16
3-16	REPEAT OSCILLATOR AND DETECTOR BOARD Schematic and Layout	(124-000353)	(12)	3-17
3-17	PEDAL FILTER BOARD Schematic, Layout and Theory	(124-000206)	(13)	3-18

LIST OF ILLUSTRATIONS
(CONTINUED)

FIGURE	11,000 SERIES			PAGE
3-18	BRIGHT PERCUSSION FILTER BOARD Schematic, Layout and Theory	(124-000208)	(14)	3-19
3-19	MIXER BOARD #2 - Schematic & Layout Theory	(124-000374)	(15)	3-20
3-20	MIXER BOARD #3 - Schematic & Layout Theory	(124-000377)	(16)	3-21
3-21	AUTO CHORD BOARD - Schematic & Layout Early Models see Page 2 for 124-000360 Board.	(124-000444)	(17)	3-22
3-22	MISCELLANEOUS BOARD - Schematic, Layout Theory.	(124-000365)	(18)	3-23
3-23	ARPEGGIATOR BOARD - Schematic, Layout & Theory	(124-047850)		3-24
3-24	REVERBERATION BOARD -Schematic,Layout & Theory	(124-000166)		3-25
3-25	POWER SUPPLY ASSEMBLY - Schematic & Layout	(126-000108-001 THRU 003)		3-26
3-26	RECTIFIER AND RELAY BOARD-Schematic & Layout	(124-000355)		3-27
3-26	FUSE BOARD - Schematic & Layout	(124-000354)		3-27
3-27	35 WATT AMP BOARD - Schematic, Layout & Theory	(124-000169)		3-28
3-28	AUTO VARI - 64 -Rhythm Unit Logic Diagram			3-30
3-29	AUTO VARI - 64 - Rhythm Theory of Operation	(SHEET 1 OF 2)		3-31
3-30	AUTO VARI - 64 - Rhythm Theory of Operation	(SHEET 2 OF 2)		3-32
3-31	PATTERN GENERATOR BOARD - Schematic & Layout	(124-000379)		3-33
3-32	RHYTHM VOICING BOARD- Schematic & Layout	(124-000380)		3-34
3-33	VARIATION BOARD - Schematic & Layout	(124-000418)		3-35
3-34	AUTO VARI - 64 - Rhythm Tracks and Variations Chart			3-36
3-35	WIRING DIAGRAMS FOR CASSETTE AND EARPHONE- Terminal Strips, Animation Cancel, Speaker & Pedal Terminal Strips			3-37
3-36	CONTROL PANEL TAB SWITCH - Wiring Chart and Chart Abbreviations Code			3-38
3-37	PLUG & PIN NUMBERS WIRING CHART See Figure 3-36 for Abbreviations Code	(P-1 THRU 27)		3-39
3-38	PLUG AND PIN NUMBERS WIRING CHART See Figure 3-36 for Abbreviations Code	(P-29 THRU 80)		3-40
3-39	PLUG & PIN NUMBERS WIRING CHART See Figure 3-36 For Abbreviations Code	(P-83 THRU J-108U)		3-41
3-40	PLUG & PIN NUMBERS WIRING CHART See Figure 3-36 for Abbreviations Code	(J108L THRU J115)		3-42
3-41	PLUG & PIN NUMBERS WIRING CHART See Figure 3-36 for Abbreviations Code	(J115 THRU J136)		3-43
3-42	PLUG & PIN NUMBERS WIRING CHART	(J137 THRU J257)		3-44


UPPER MANUAL
UPPER MANUAL SIGNALS
MANUAL KEYING TERMINALS
380 DIVIDERS & KEYERS 124-000223-002
13 DAUGHTER BOARDS 124-000340
KEYER CUTOFF ADJUST
PEDAL KEYING TERMINALS
MDD OUTPUTS
SYNC
FROM J146
FROM J109, LOWER MAN.
J108
UPPER MANUAL SIGNALS
ARPEGGIATOR ASSEMBLY 121-000163
ARPEGGIATOR SWITCH
124-000201
124-000202
124-000204
OCTAVE FILTERS
OUTPUT AMP Q14
PHASE INV.
LOWER MANUAL
LOWER MANUAL SIGNALS
ARPEGGIAMATIC CIRCUIT 124-047850
380 DIVIDERS & KEYERS 124-000223
13 DAUGHTER BOARDS 124-000341
FROM J110 U/M
TO J109 U/M
NOT USED
LOWER MANUAL SIGNALS
PEDAL SWITCH ASSEMBLY 120-000072
BANJO TAB
PIZZICATO 2
PIANO SOLO NO.
PIANO SOLO TAB



094-049169-A, LOGIC SCHEMATIC DIAGRAM OF 11100 SERIES ORGAN

FIGURE 3-2
11,000 SERIES CONSOLE
LOGIC DIAGRAM
(SHEET 2 OF 2)

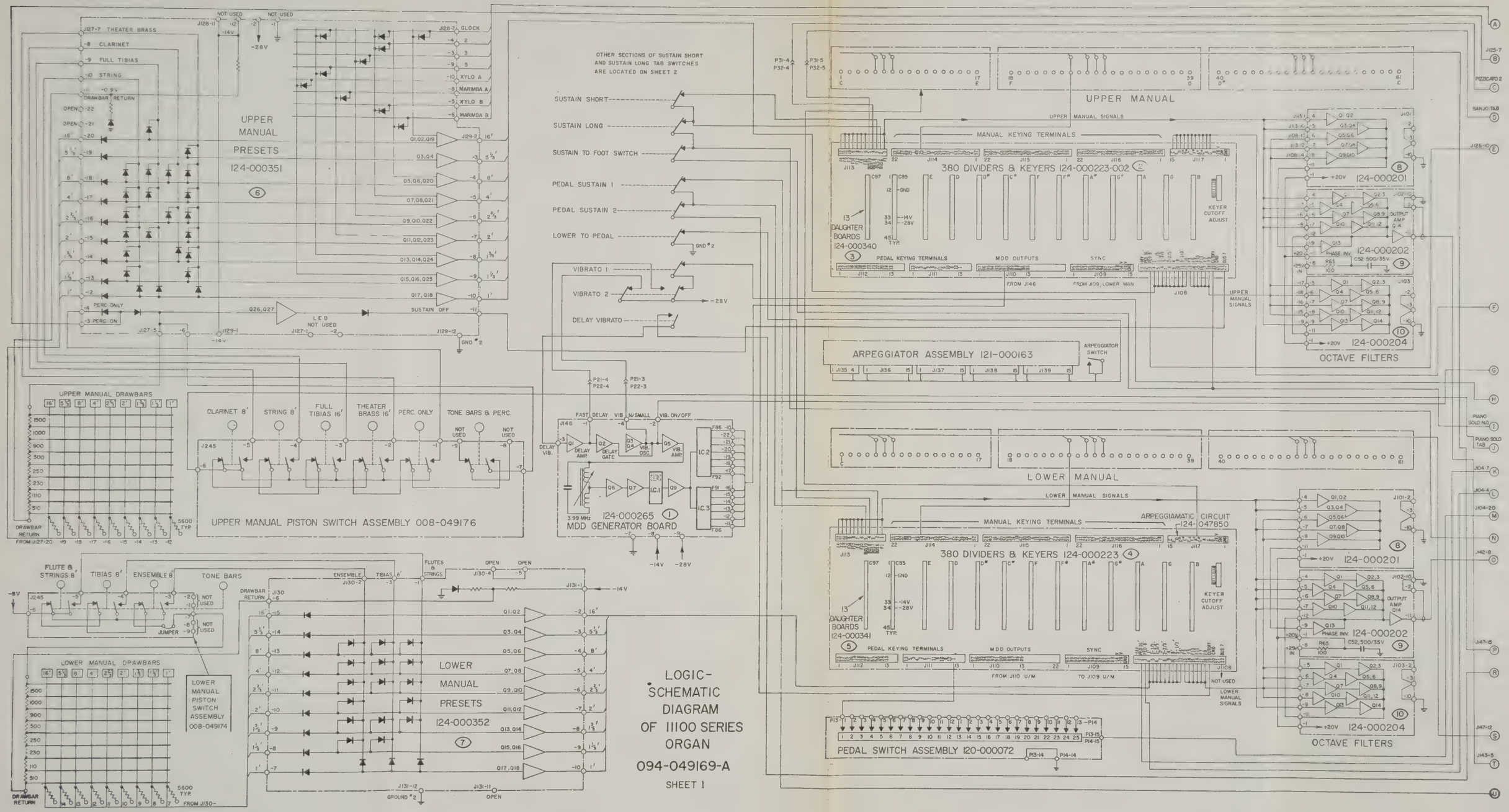


FIGURE 3-1
11,000 SERIES CONSOLE
LOGIC DIAGRAM
(SHEET 1 OF 2)

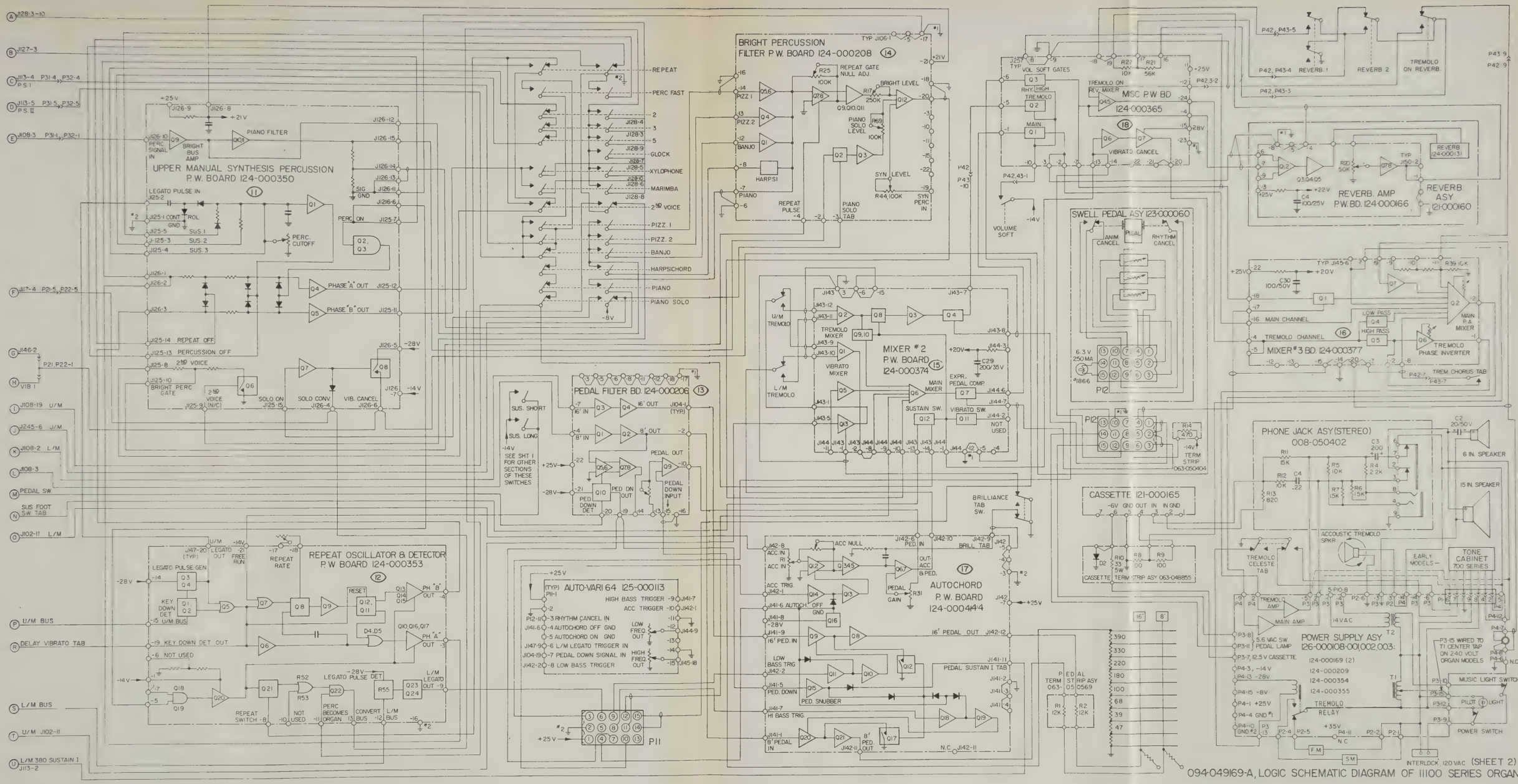
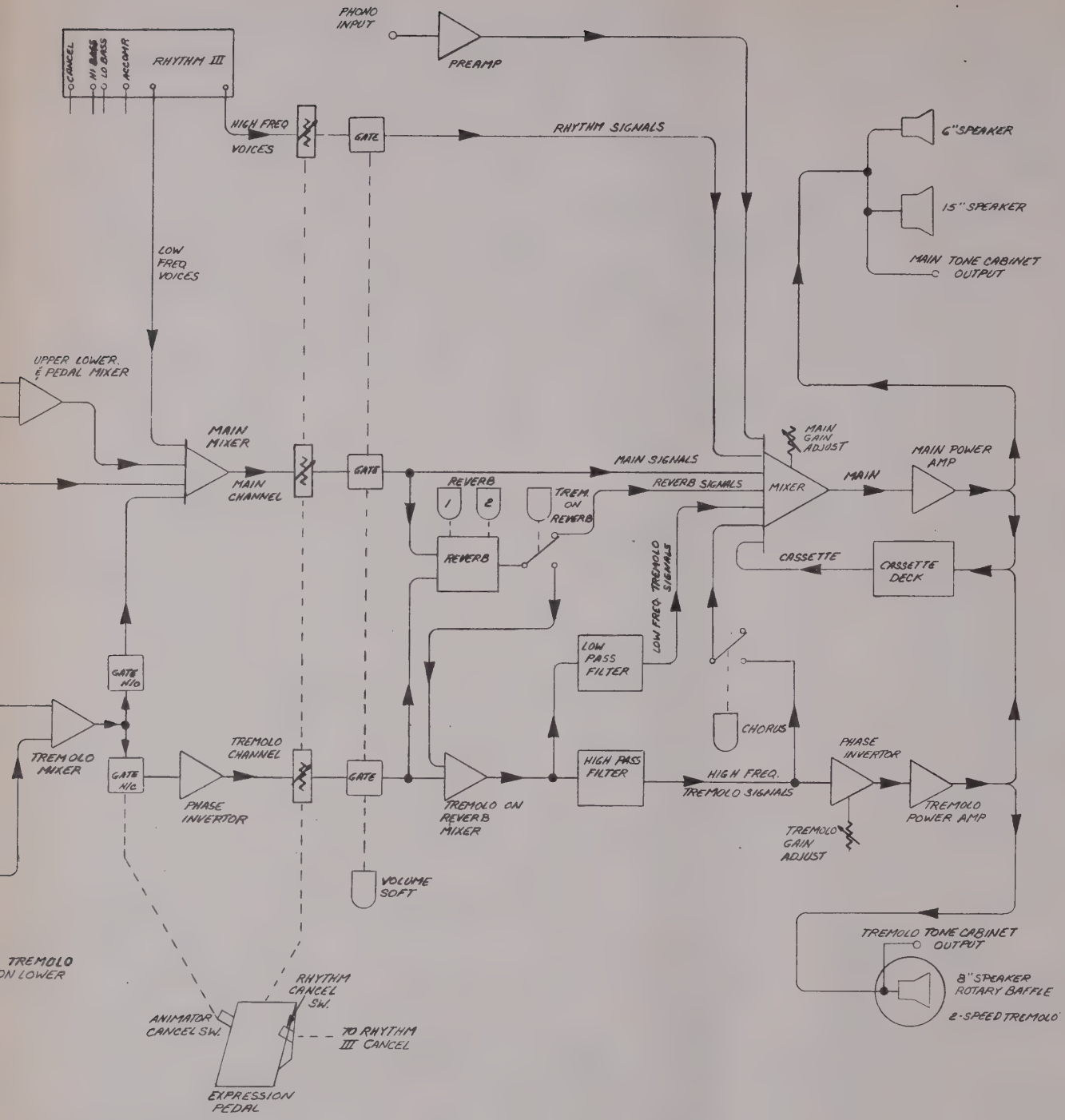
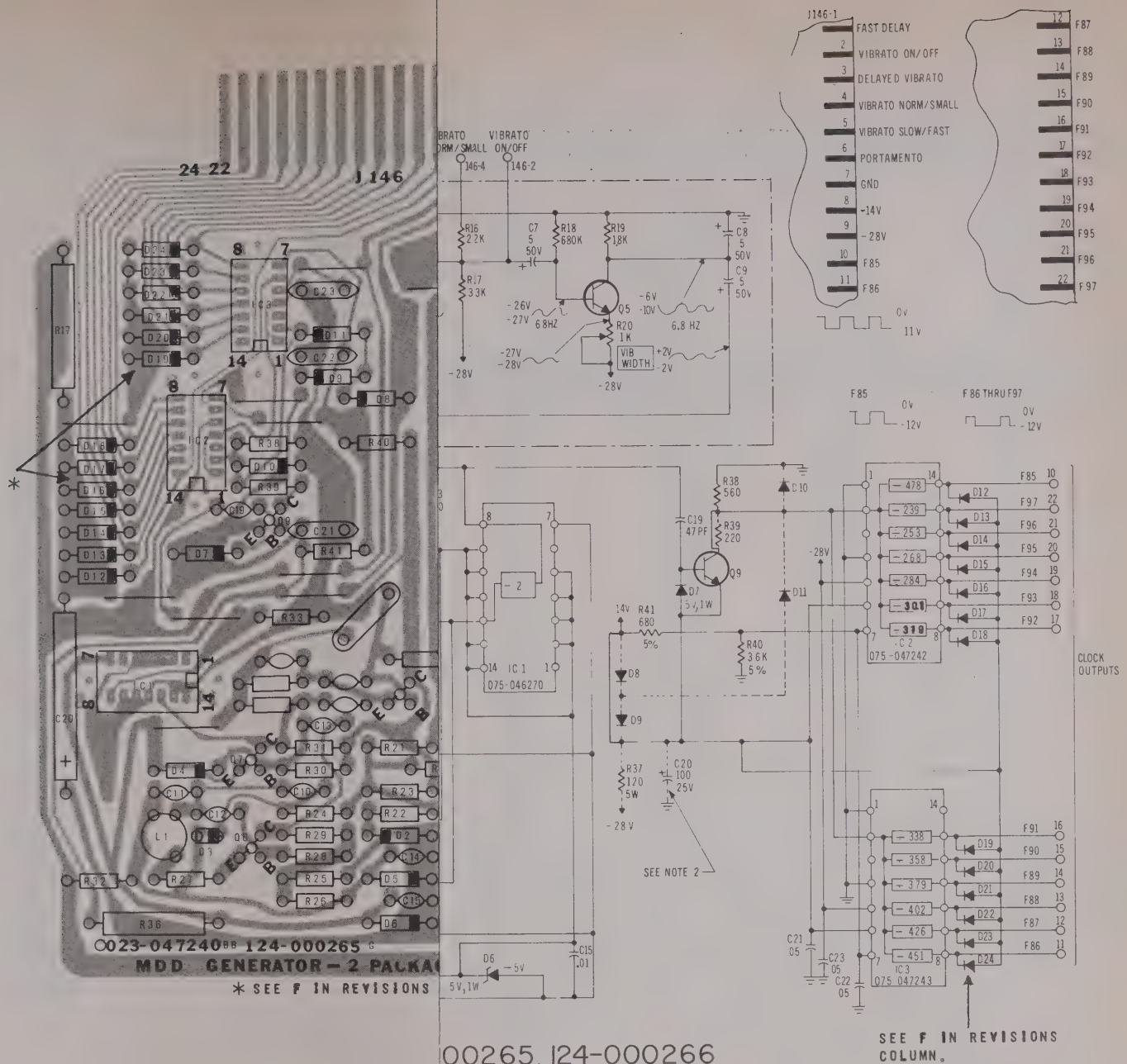


FIGURE 3-2
11,000 SERIES CONSOLE
LOGIC DIAGRAM
(SHEET 2 OF 2)


PHONO INPUT
PREAMP
RHYTHM III
CANCEL
HI BASS
LO BASS
ACCOMP
HIGH FREQ VOICES
GATE
RHYTHM SIGNALS
6" SPEAKER
15" SPEAKER
MAIN TONE CABINET OUTPUT
LOW FREQ VOICES
UPPER LOWER & PEDAL MIXER
MAIN MIXER
MAIN CHANNEL
GATE
MAIN SIGNALS
REVERB SIGNALS
REVERB
1
2
TREM. ON REVERB
REVERB
MAIN GAIN ADJUST
MIXER
MAIN
MAIN POWER AMP
CASSETTE
CASSETTE DECK
LOW FREQ. TREMOLO SIGNALS
LOW PASS FILTER
CHORUS
GATE N/a
TREMOLO MIXER
GATE N/c
TREMOLO CHANNEL
PHASE INVERTOR
GATE
TREMOLO ON REVERB MIXER
HIGH PASS FILTER
HIGH FREQ. TREMOLO SIGNALS
PHASE INVERTOR
TREMOLO GAIN ADJUST
TREMOLO POWER AMP
VOLUME SOFT
TREMOLO TONE CABINET OUTPUT
8" SPEAKER ROTARY BAFFLE
2-SPEED TREMOLO
TREMOLO
ON LOWER
RHYTHM CANCEL SW.
ANIMATOR CANCEL SW.
TO RHYTHM III CANCEL
EXPRESSION PEDAL



00265, 124-000266

47241-F

MDD GENERATOR-TWO PACKAGE SYSTEM
VIBRATOABLE

Drawing 094-047241 is the schematic
assembly 124-000265 (MDD with vibra
oscillator) and for assembly 124-00
with crystal oscillator). As indic
drawing, there are two "boxed-in" a
to be used for 124-000265 and the o
124-000266; parts not in the boxed
common to both assemblies. In addi
third assembly, 124-000318, is show

LC Oscillator With Vibrato

Assembly 124-000265 includes a vibr
lator, delayed vibrato circuitry, P
capability (Auto-Glide), and a high
quency LC oscillator used to drive
generator.

The vibrato oscillator is a phase s
comprised of C3,C4,C5,R9,R10,R11,R1
Q3 and Q4. Pot R10 is used to adju
oscillator's frequency (6.8 HZ. nom
fast vibrato); and R8 is externally
to -28 volts for fast vibrato (disc
for slow vibrato). The vibrato sig
led through C6, R15, and C7 to the
transistor Q5, where it is amplifie
being controlled by R20).

by dotted lines are
ies. IC1 is a signa
ure a square input
duty cycle to drive
divider (IC1) may b
al oscillator or the
he -5 volts for this
R36 and bypassed by

D frequency genera-
ncies F92 through
s frequencies F86
uffer Q9, supplying
lock signal for the
and D11 supply pro-
t gates on the MDD

Three power supplies, -11 volts, -16 volts, and -28 volts, are required for the operation of the two MDD packages. The -28 volts is supplied from the organ power supply. The -16 volts supply is generated by two diode drops (D8,9) from -14 volts through R37 to -28 volts. R40 and R41 form a voltage divider between ground and -14 volts to generate the -11 volt supply. (The -11 volt current, and the -16 volt supply may draw 24 to 70 MA.) Each of the three supplies is protected from static discharge by a capacitor (C21,22,23). The -16 volt supply is filtered by C20.

All outputs of the MDD generator IC packages are protected by a diode connected to -16 volts (diodes D12 to D24).

FIGURE 3-4
MDD GENERATOR BOARD
SCHEMATIC, LAYOUT & THEORY
(124-000265)

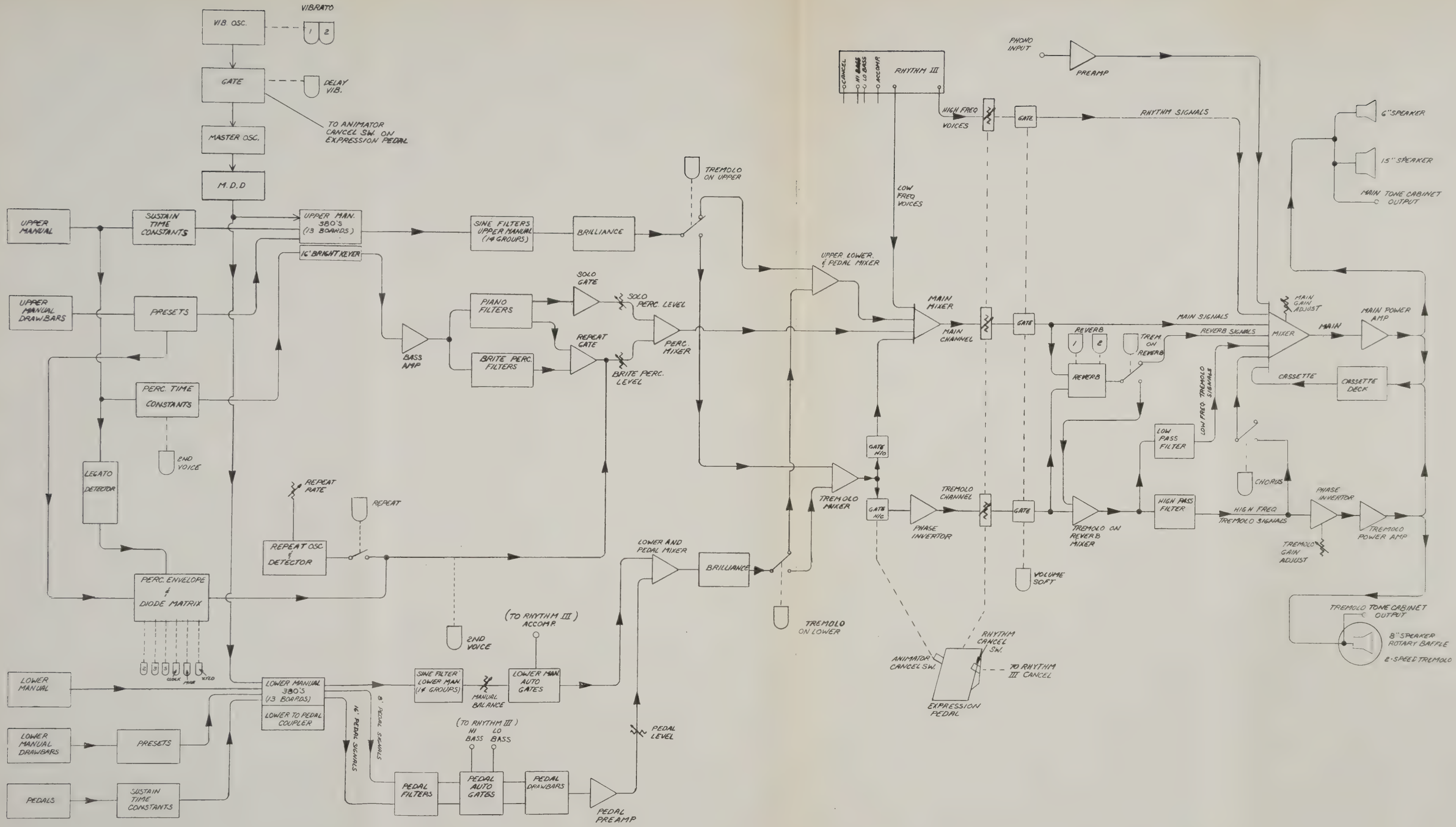
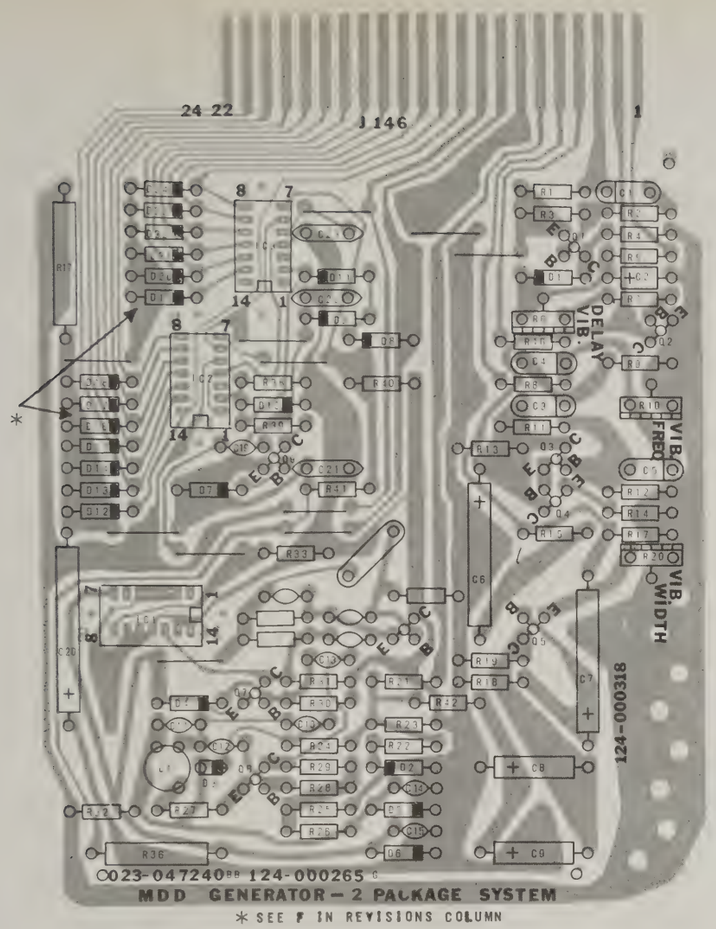
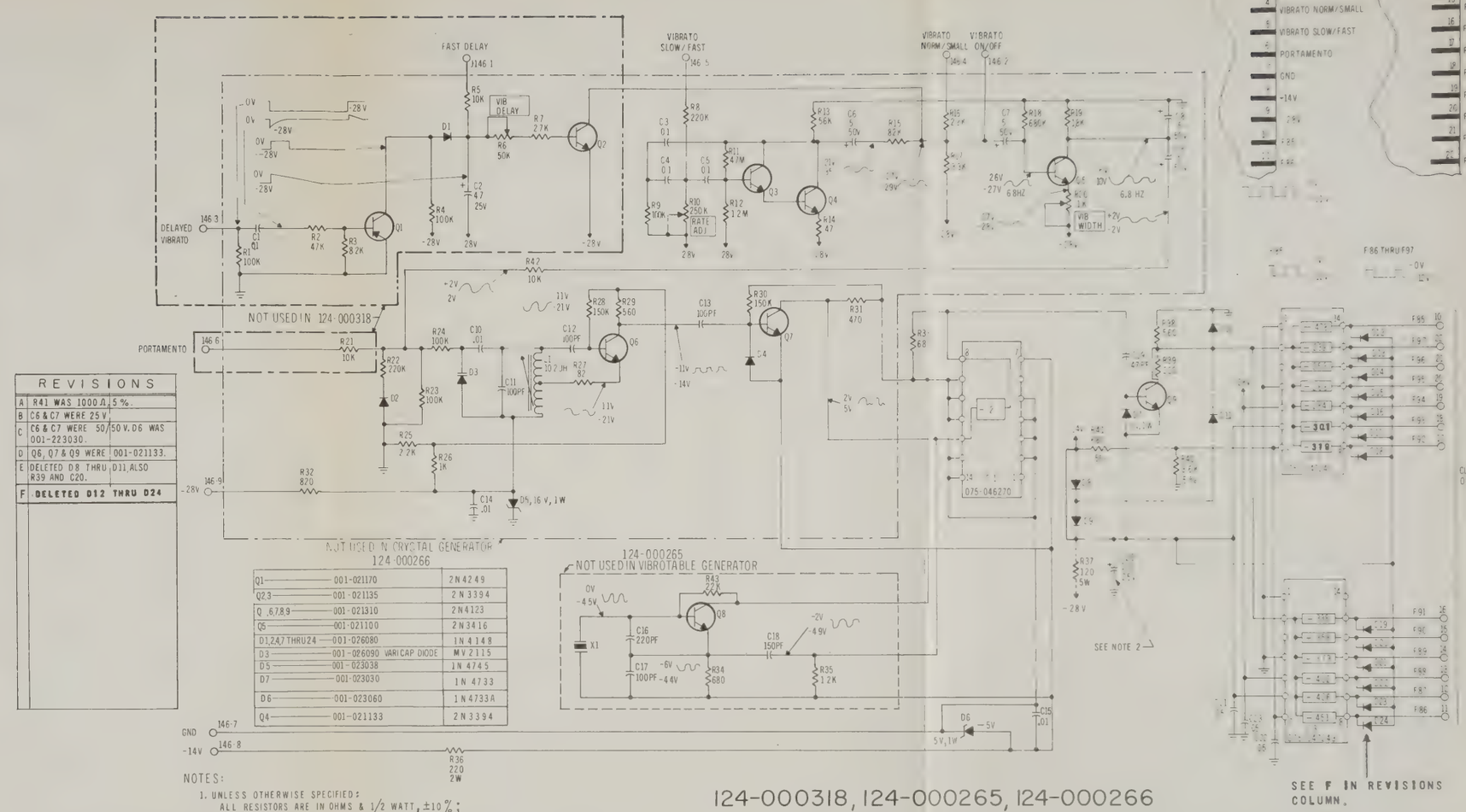


FIGURE 3-3
11,000 SERIES CONSOLE
BLOCK DIAGRAM





REVISIONS
A R41 WAS 1000Ω, 5%.
B C6 & C7 WERE 25 V.
C C6 & C7 WERE 50/50 V. D6 WAS 001-223030.
D Q6, Q7 & Q9 WERE 001-021133.
E DELETED D8 THRU D11, ALSO R39 AND C20.
F DELETED D12 THRU D24

Q1	001-021170	2N4249
Q2,3	001-021135	2N3394
Q 6,7,8,9	001-021310	2N4123
Q5	001-021100	2N3416
D1,2,4,7 THRU 24	001-026080	1N4148
D3	001-026090 VARICAP DIODE	MV2115
D5	001-023038	1N4745
D7	001-023030	1N4733
D6	001-023060	1N4733A
Q4	001-021133	2N3394

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS & 1/2 WATT, ±10%;
   ALL CAPACITORS ARE IN MICROFARADS.
2. COMPONENTS WITH CONNECTIONS IN DOTTED LINES WERE USED IN EARLIER MODELS, REF. REV ISSUE "E".

124-000318, 124-000265, 124-000266

094-047241-F

MDD GENERATOR-TWO PACKAGE SYSTEM
VIBRATOABLE

Drawing 094-047241 is the schematic diagram for assembly 124-000265 (MDD with vibratoable LC oscillator) and for assembly 124-000266 (MDD with crystal oscillator). As indicated on the drawing, there are two "boxed-in" areas; one to be used for 124-000265 and the other for 124-000266; parts not in the boxed areas are common to both assemblies. In addition, a third assembly, 124-000318, is shown.

LC Oscillator With Vibrato

Assembly 124-000265 includes a vibrato oscillator, delayed vibrato circuitry, portamento capability (Auto-Glide), and a high frequency LC oscillator used to drive the MDD generator.

The vibrato oscillator is a phase shift type, comprised of C3,C4,C5,R9,R10,R11,R12,R13,R14, Q3 and Q4. Pot R10 is used to adjust the oscillator's frequency (6.8 HZ. nominal for fast vibrato); and R8 is externally connected to -28 volts for fast vibrato (disconnected for slow vibrato). The vibrato signal is coupled through C6, R15, and C7 to the base of transistor Q5, where it is amplified (its width being controlled by R20).

Vibrato may be turned off by connecting J146-2 to -28 volts, and may be reduced for "Vibrato Small" by connecting R16 through Pin J146-4 to -28 volts. To achieve a better sine wave the vibrato signal is filtered by C8 and is then coupled to the LC oscillator circuitry by C9 and R42. Delayed vibrato is accomplished by transistors Q1 and Q2. A -28 volt DC signal is applied to C1, which turns on Q1 for about 20 milliseconds; this charges C2 through D1 to a ground potential, turning on Q2 for approximately one second (until C2 discharges). When Q2 is turned on, the collector "shorts" the vibrato signal to -28 volts, thus the delayed vibrato time is approximately one second. Adjustment of R6 decreases or increases the time of the delayed vibrato. If the delayed vibrato signal is applied to C1 while J146-1 is connected to -28 volts, the vibrato delay time is decreased by 90 per cent.

The LC oscillator is comprised of L1,D3,C10,C11, C12,R27,R28,R29, and Q6, and is a Hartley type. D3, a varicap diode, is used to vary the oscillator's frequency for vibrato and portamento effects; as the voltage at the junction of R24, C10, and D3 becomes more negative, the capacitance of the varicap diode increases, and the oscillator frequency decreases. Since the cathode of the varicap is normally (with no vibrato) at ground potential and the anode is held at -16 volts by D5 and R32, the capacitance of the varicap remains constant (about 57 picofarads), and stability of the oscillator is maintained. Capacitor C10 is not part of the tank capacitance, but is used to isolate the DC bias on the varicap from the tank circuit. L1, in parallel with C11 and the varicap diode oscillate at 3.99872 M HZ. R28 and R29 are connected to -11 volts (generated by voltage divider R25 and R26) to supply an oscillator output swing of three volts.

A 6 per cent decrease in the oscillator frequency (Portamento, or "Auto-Glide") is caused by applying -8 volts to R21 at J146-6.

The oscillator signal is coupled through C13 to buffer amplifier Q7 which drives IC1.

A variation of the vibratoable MDD generator is assembly 124-000318. On this assembly the delayed vibrato circuitry (Q1,Q2,R1,R2,R3,R4,R5,R6,R7, D1,C1, and C2) and the Portamento resistor (R21) are removed. This assembly is used on organs not requiring delayed vibrato or Portamento capabilities.

The 124-000318 MDD assembly is completely interchangeable with the 124-000265 MDD assembly.

MDD Generator

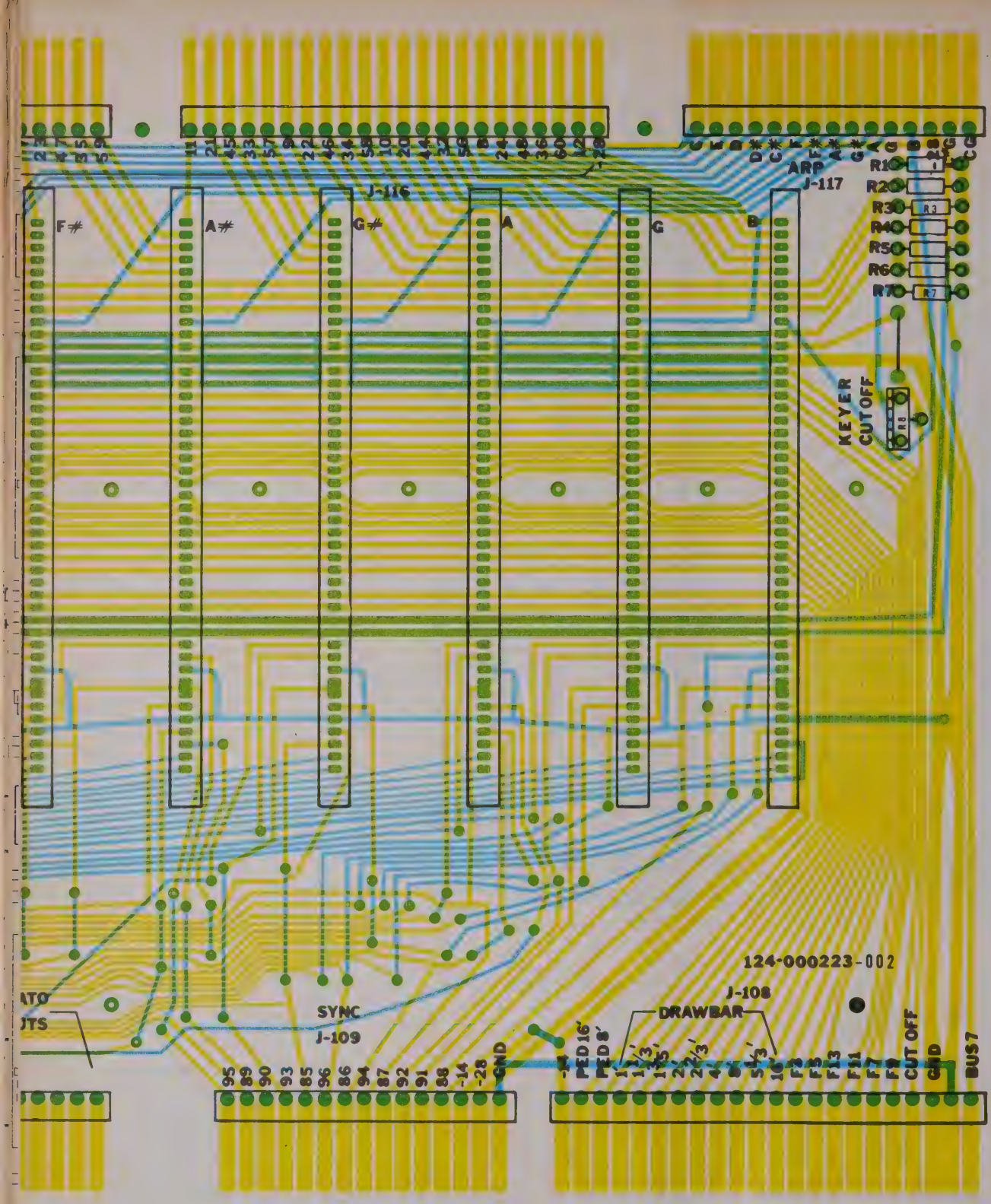
Components not "boxed-in" by dotted lines are common to both the assemblies. IC1 is a signa divider; it is used to insure a square input signal with a 50 per cent duty cycle to drive the MDD IC packages. This divider (IC1) may b driven by either the crystal oscillator or the vibratoable oscillator. The -5 volts for this IC is generated by D6 and R36 and bypassed by C15.

IC2 and IC3 are the two MDD frequency generators; IC2 generates frequencies F92 through F97 and F85. IC3 generates frequencies F86 through F91. IC1 drives buffer Q9, supplying an 11 volt 1.99936 M HZ. clock signal for the MDD packages. Diodes D10 and D11 supply protection for the clock input gates on the MDD packages.

Three power supplies, -11 volts, -16 volts, and -28 volts, are required for the operation of the two MDD packages. The -28 volts is supplied from the organ power supply. The -16 volts supply is generated by two diode drops (D8,9) from -14 volts through R37 to -28 volts. R40 and R41 form a voltage divider between ground and -14 volts to generate the -11 volt supply. (The -11 volt current, and the -16 volt supply may draw 24 to 70 MA.) Each of the three supplies is protected from static discharge by a capacitor (C21,22,23). The -16 volt supply is filtered by C20.

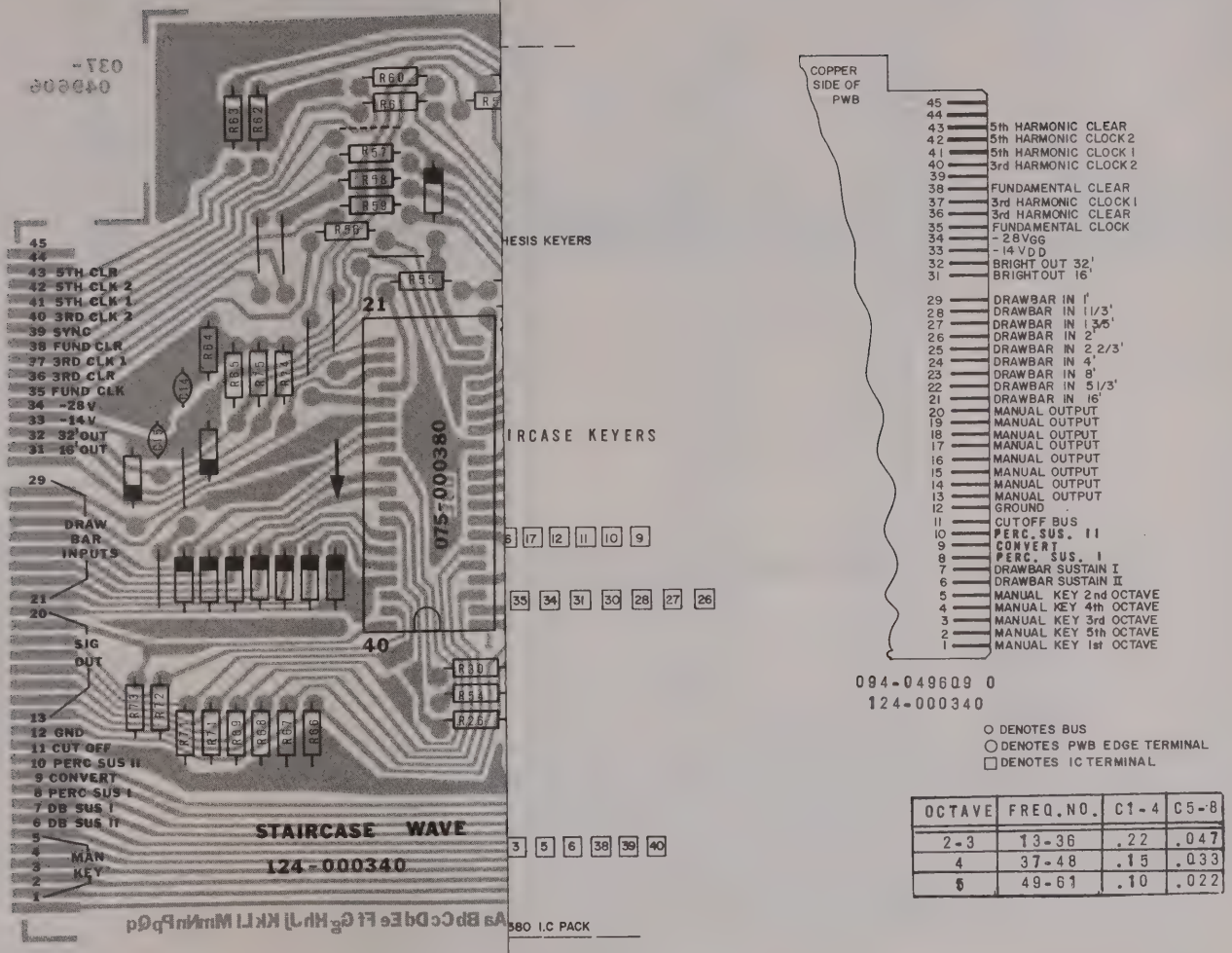
All outputs of the MDD generator IC packages are protected by a diode connected to -16 volts (diodes D12 to D24).

FIGURE 3-4
MDD GENERATOR BOARD
SCHEMATIC, LAYOUT & THEORY
(124-000265)



AL SYNTHESIS MOTHER BOARD

265 board) enter at J-110, nter boards (124-000223). n the Lower Manual Synthes- is used to synchronize fre- uals and as harmonics of manual, to prevent cancel- chronizing output is mis- Black Tonebars) usually bar inputs (J108) come tches via the Preset Boards e adjusts the keyer supply voltage and therefore the square-wave output current. To minimize the interaction between keyers feeding the same filter, the input impedance of the filter is 100 ohms or less. Therefore, the output voltage at the filter terminals (J108 and J113) is very low when the filters are connected. A keyer cut-off control near J117 adjusts the decay limit of the keying voltage during sustain. J114, J116, and J117 are marked with key numbers. These are the upper manual outputs.



OCTAVE	FREQ. NO.	C1-4	C5-8
2-3	13-36	.22	.047
4	37-48	.15	.033
5	49-61	.10	.022

124-000340 - STAIRCASE WAVE PERCU

The 124-000340 Daughter Board con
LSI package with static electrici
circuitry. In addition, 5 sustai
serve 5 octavely related synthesi to
piano/organ convertible time cons
staircase wave keyers. The stair
sizis keyer time constants are co
propriate contacts on the board e
that the first octave synthesis k
have a corresponding staircase ke

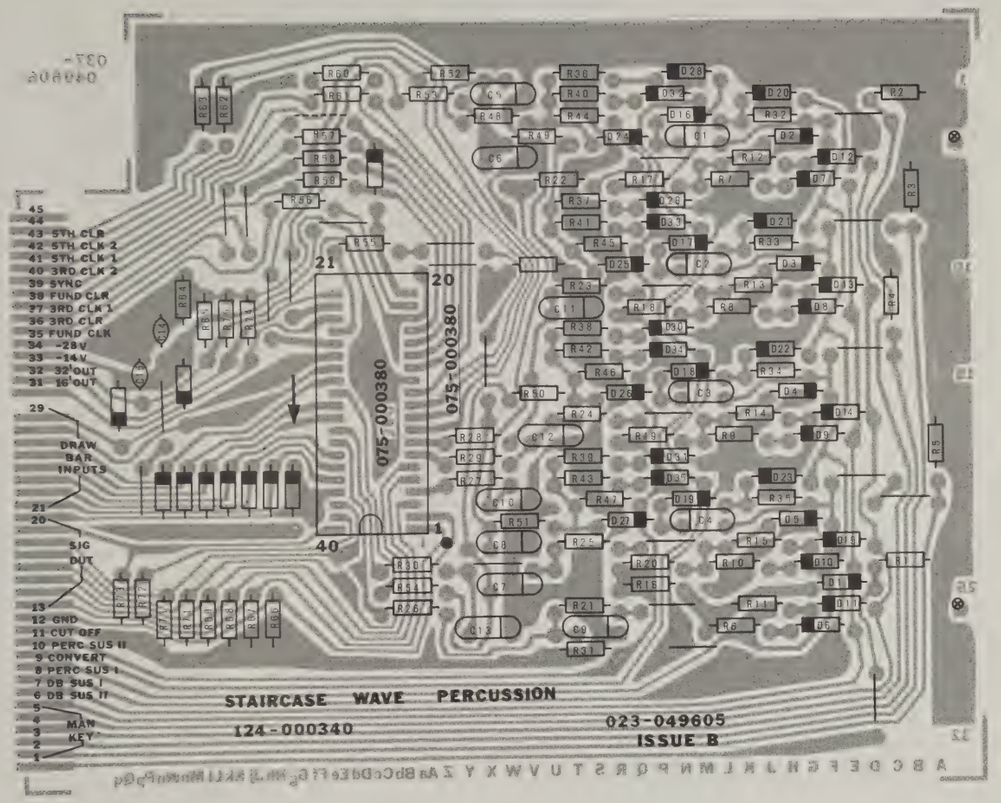
FIGURE 3-6
STAIRCASE WAVE PERCUSSION BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000340)

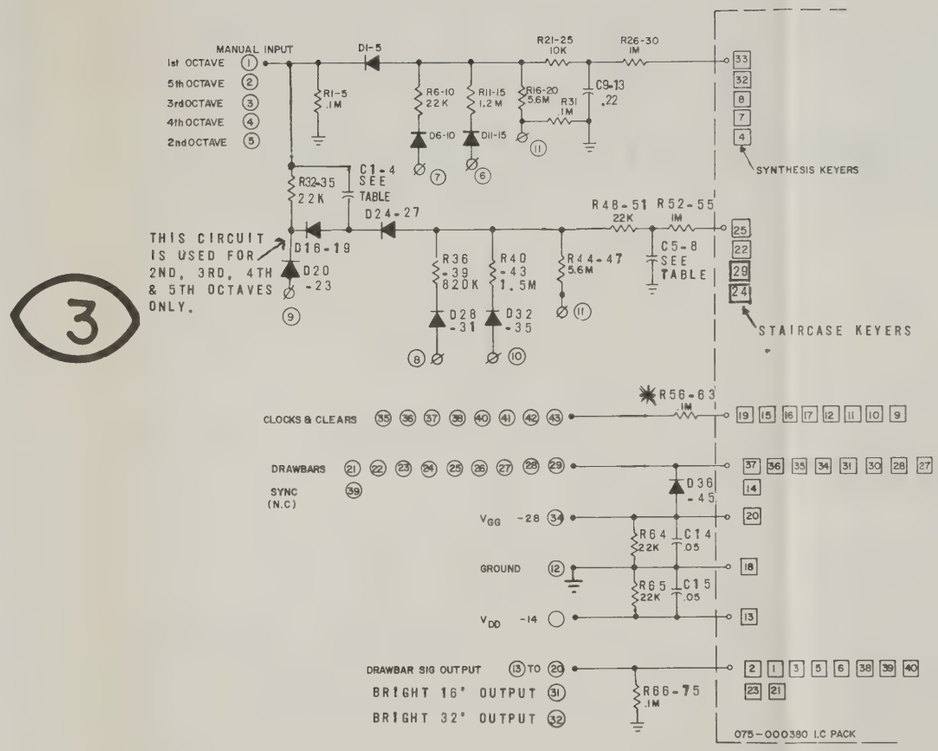
2

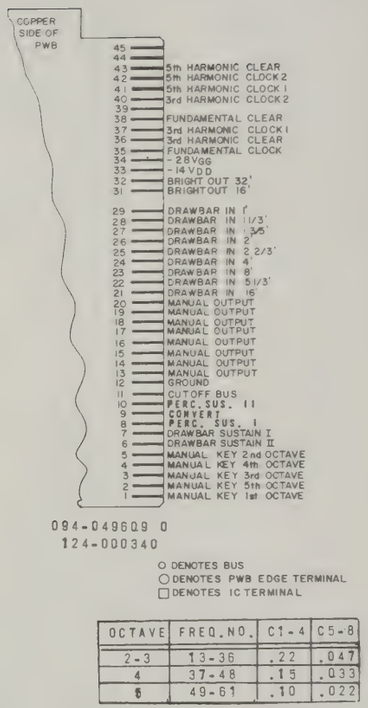
FIGURE 3-5
UPPER MANUAL SYNTHESIS
MOTHER BOARD-SCHEMATIC,
LAYOUT AND THEORY
(124-000223-002)

124-000223-002 UPPER MANUAL SYNTHESIS MOTHER BOARD

MDD signals (from 124-000265 board) enter at J-110, then go to one of 13 daughter boards (124-000223). A master pulse output from the Lower Manual Synthesis assembly (124-000223) is used to synchronize frequencies used on both manuals and as harmonics of several notes on the same manual, to prevent cancellation effects. When synchronizing output is missing, the odd harmonics (Black Tonebars) usually will not sound. The tonebar inputs (J108) come from the tonebar stop switches via the Preset Boards this negative D.C. voltage adjusts the keyer supply voltage and therefore the square-wave output current. To minimize the interaction between keyers feeding the same filter, the input impedance of the filter is 100 ohms or less. Therefore, the output voltage at the filter terminals (J108 and J113) is very low when the filters are connected. A keyer cut-off control near J117 adjusts the decay limit of the keying voltage during sustain. J114, J116, and J117 are marked with key numbers. These are the upper manual outputs.







OCTAVE	FREQ. NO.	C1-4	C5-8
2-3	13-36	.22	.047
4	37-48	.15	.033
5	49-61	.10	.022

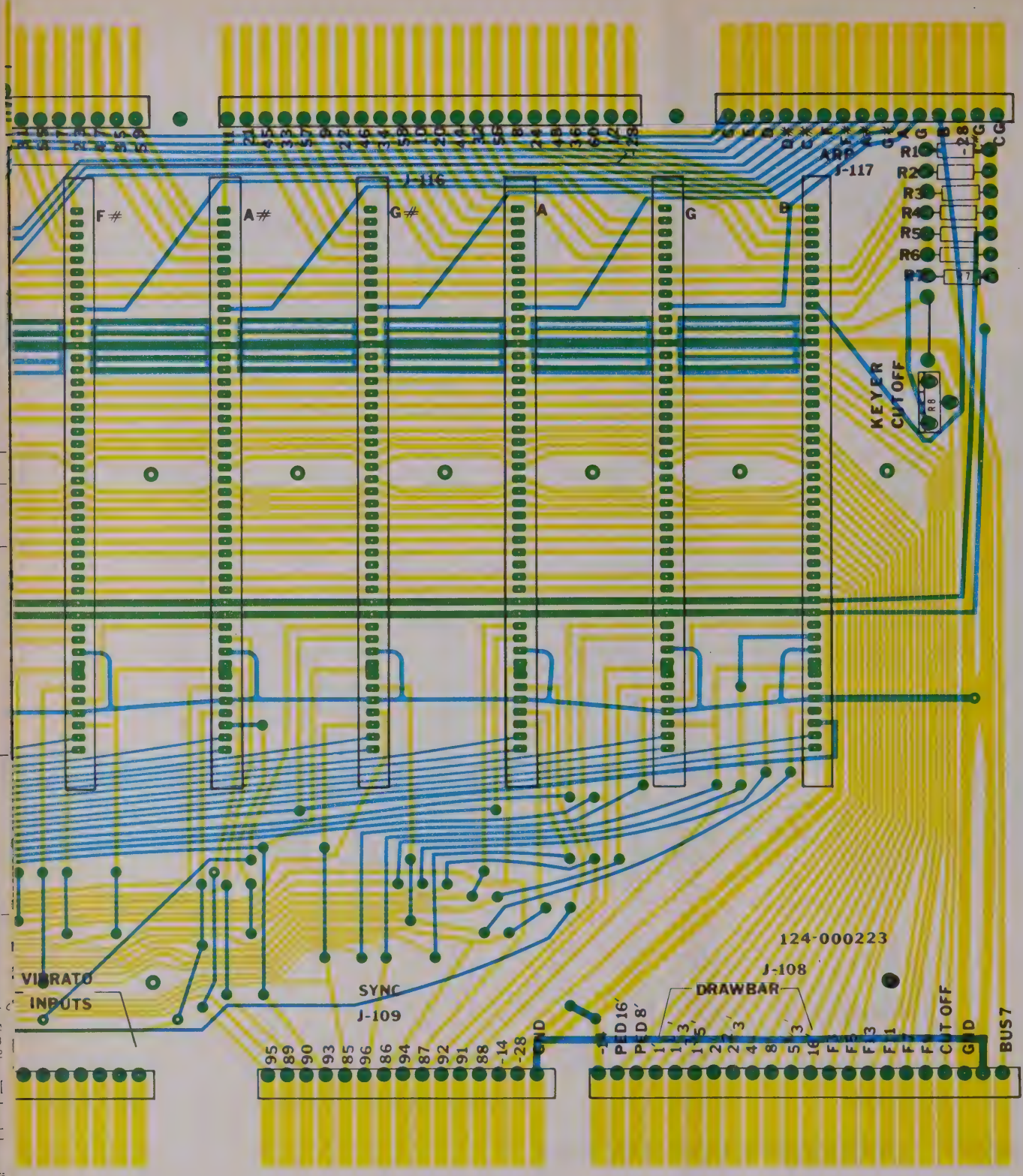
124-000340 - STAIRCASE WAVE PERCUSSION BOARD

The 124-000340 Daughter Board consists of one LSI package with static electricity protective circuitry. In addition, 5 sustain time constants serve 5 octavely related synthesis keyers and 4 piano/organ convertible time constants serve 4 staircase wave keyers. The staircase and synthesizis keyer time constants are connected to appropriate contacts on the board edge. Note here, that the first octave synthesis keyer does not have a corresponding staircase keyer.

The staircase wave perc. 380 daughter board 124-000340 serves 5 keys to provide 9 pitches of synthesis (drawbar controlled) square waves with two degrees of sustain, together with 4 octavely related keys to provide 2 pitches of staircase waves @ 32' and 16' pitch. The time constants associated with the latter keyers are designed to selectively provide three degrees of percussive envelopes or the normal sustained organ type tone.

NOTE:
*R-60 changed to 27K ohms

FIGURE 3-6
STAIRCASE WAVE PERCUSSION BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000340)



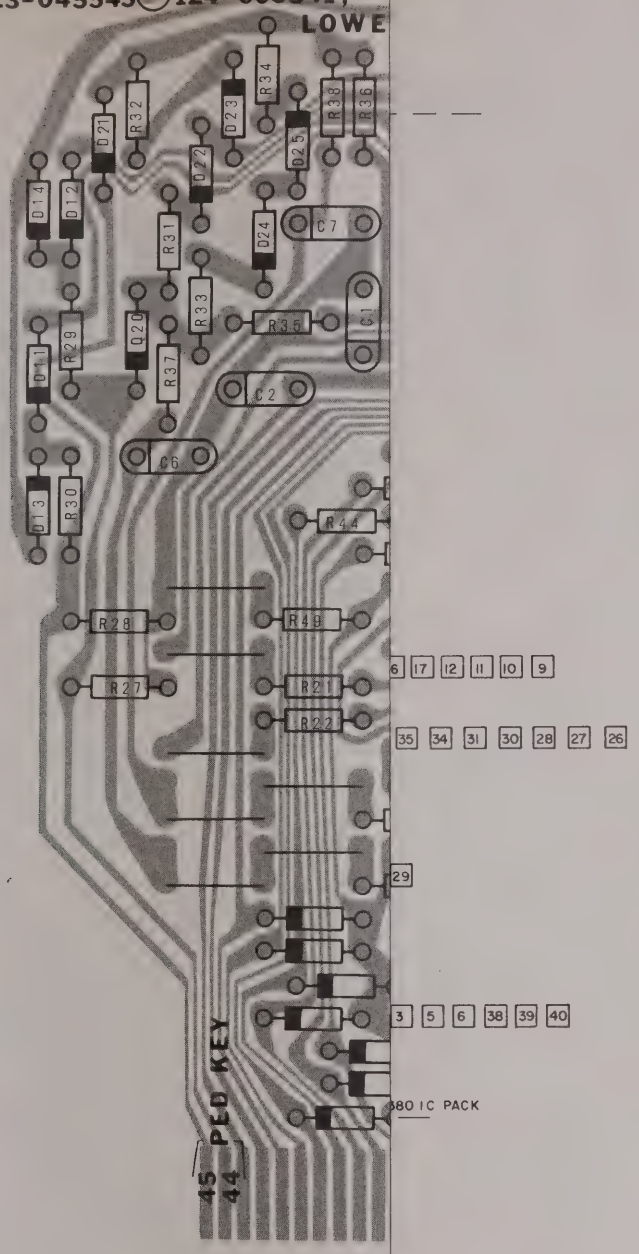
123-000223 LOWER MANUAL
SYNTHESIS MOTHER BOARD

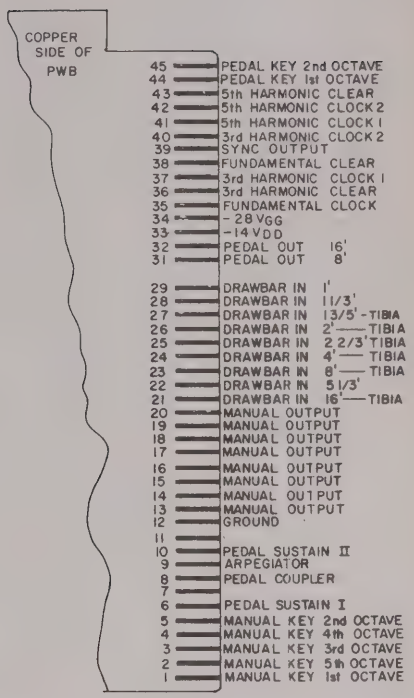
C85

The action of the Lower Manual Synthesis assembly is in many respects, the same as the other "380" components, it has some additional functions, however, such as: 1. Pedal keying, utilizing the stair-step-wave outputs on the "380" IC's. 2. Producing a pulse signal output at J109 for the synchronization of all generator keyers, and 3. Providing inputs for the Arpeggiator keyboard, (124-047850) at J117. J111 and J112 are outputs to Pedal Filter Board (124-000206). There is no synthesis or bright percussion available on the lower manual.

023-045545 124-000341,

LOWE




COPPER SIDE OF PWB
45 PEDAL KEY 2nd OCTAVE
44 PEDAL KEY 1st OCTAVE
43 5th HARMONIC CLEAR
42 5th HARMONIC CLOCK 2
41 5th HARMONIC CLOCK 1
40 3rd HARMONIC CLOCK 2
39 SYNC OUTPUT
38 FUNDAMENTAL CLEAR
37 3rd HARMONIC CLOCK 1
36 3rd HARMONIC CLEAR
35 FUNDAMENTAL CLOCK
34 -28 VGG
33 -14 VDD
32 PEDAL OUT 16'
31 PEDAL OUT 8'
29 DRAWBAR IN 1'
28 DRAWBAR IN 1 1/3'
27 DRAWBAR IN 1 3/5' - TIBIA
26 DRAWBAR IN 2' — TIBIA
25 DRAWBAR IN 2 2/3' TIBIA
24 DRAWBAR IN 4' — TIBIA
23 DRAWBAR IN 8' — TIBIA
22 DRAWBAR IN 5 1/3'
21 DRAWBAR IN 16' — TIBIA
20 MANUAL OUTPUT
19 MANUAL OUTPUT
18 MANUAL OUTPUT
17 MANUAL OUTPUT
16 MANUAL OUTPUT
15 MANUAL OUTPUT
14 MANUAL OUTPUT
13 MANUAL OUTPUT
12 GROUND
11
10 PEDAL SUSTAIN II
9 ARPEGIATOR
8 PEDAL COUPLER
7
6 PEDAL SUSTAIN I
5 MANUAL KEY 2nd OCTAVE
4 MANUAL KEY 4th OCTAVE
3 MANUAL KEY 3rd OCTAVE
2 MANUAL KEY 5th OCTAVE
1 MANUAL KEY 1st OCTAVE

Ø DENOTES BUS
○ DENOTES PWB EDGE TERMINAL
□ DENOTES IC TERMINAL
ALL DIODES 001-026080

(7) (11)
UNUSED TERMINALS

094-049617 0
124-000341

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124-00034
DAUGHTER

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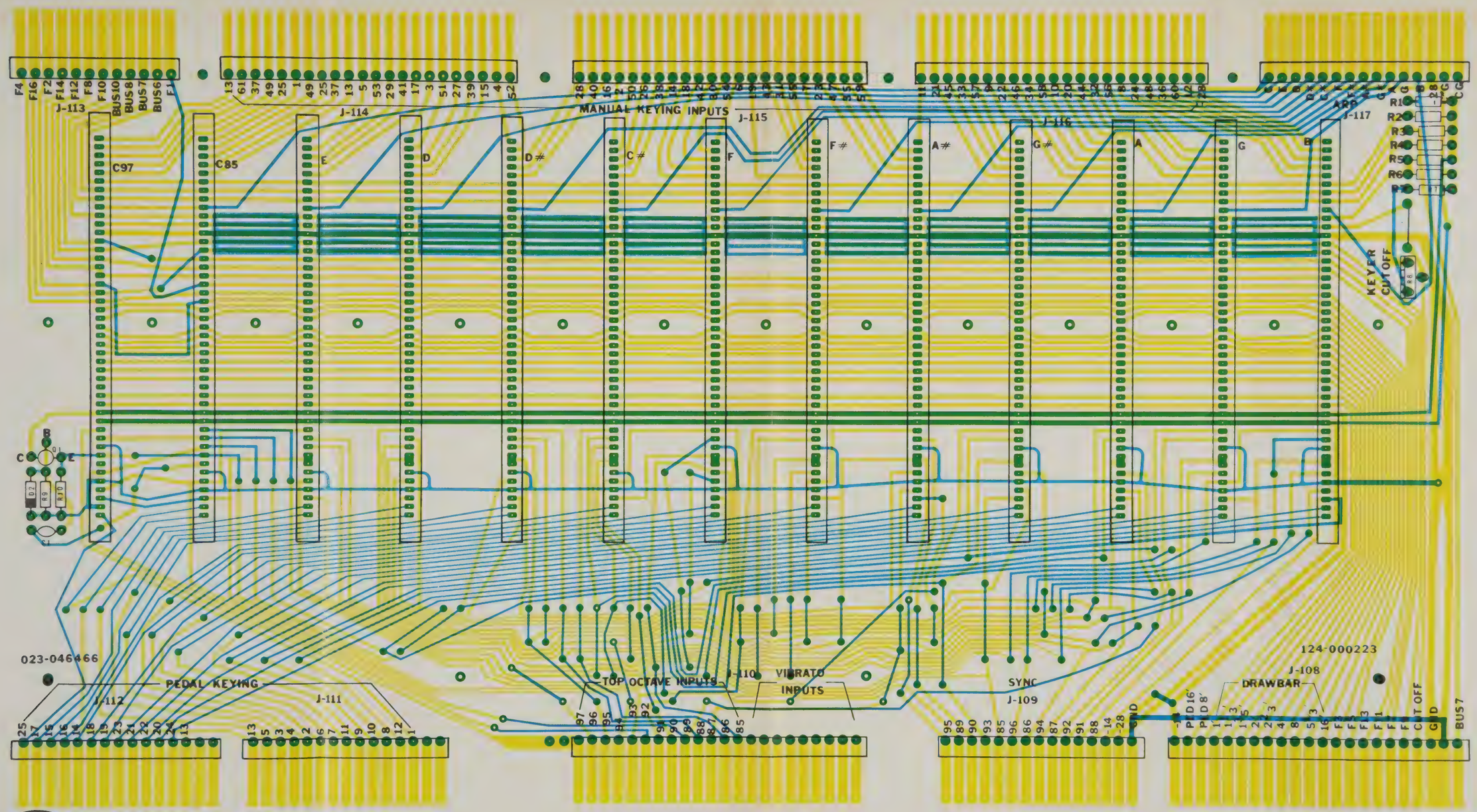
FIGURE 3-8
LOWER MANUAL SYNTHESIS
DAUGHTER BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000341)



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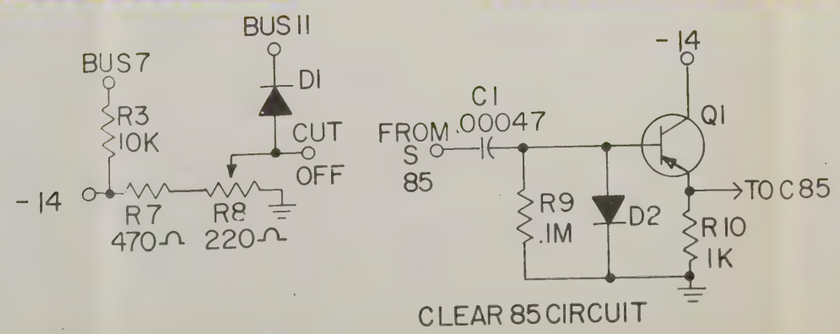
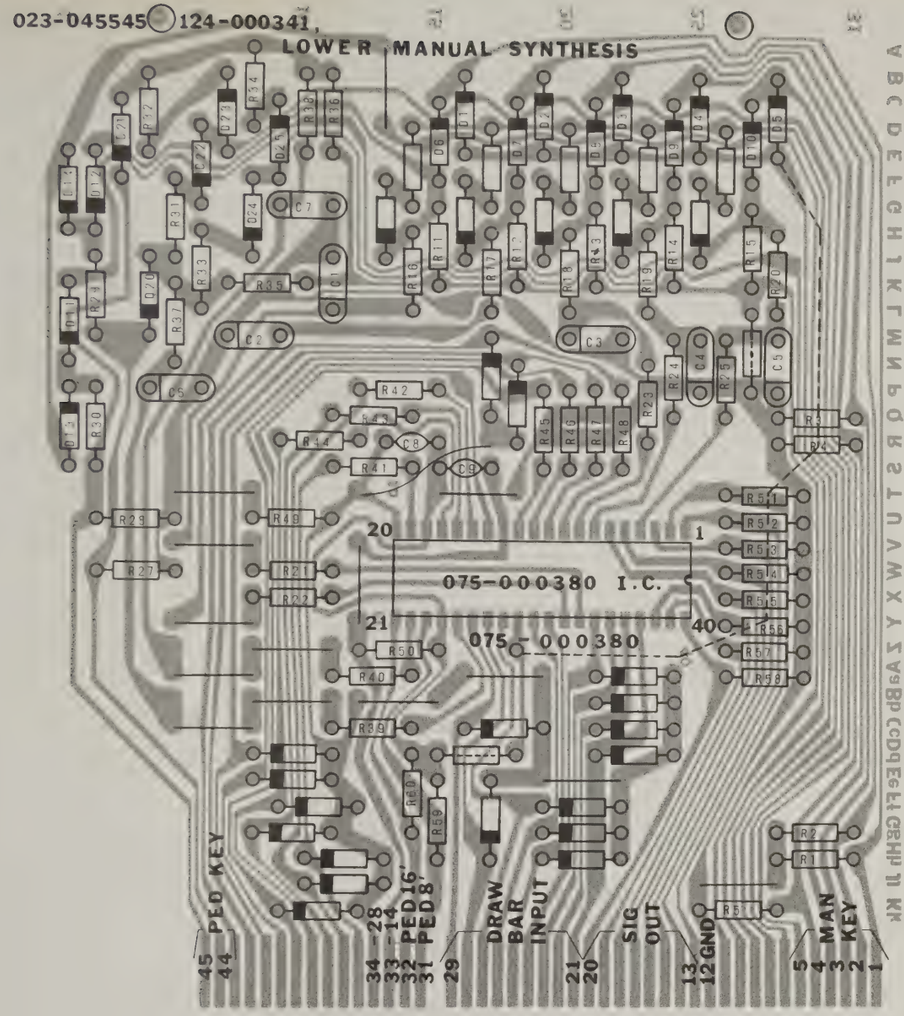
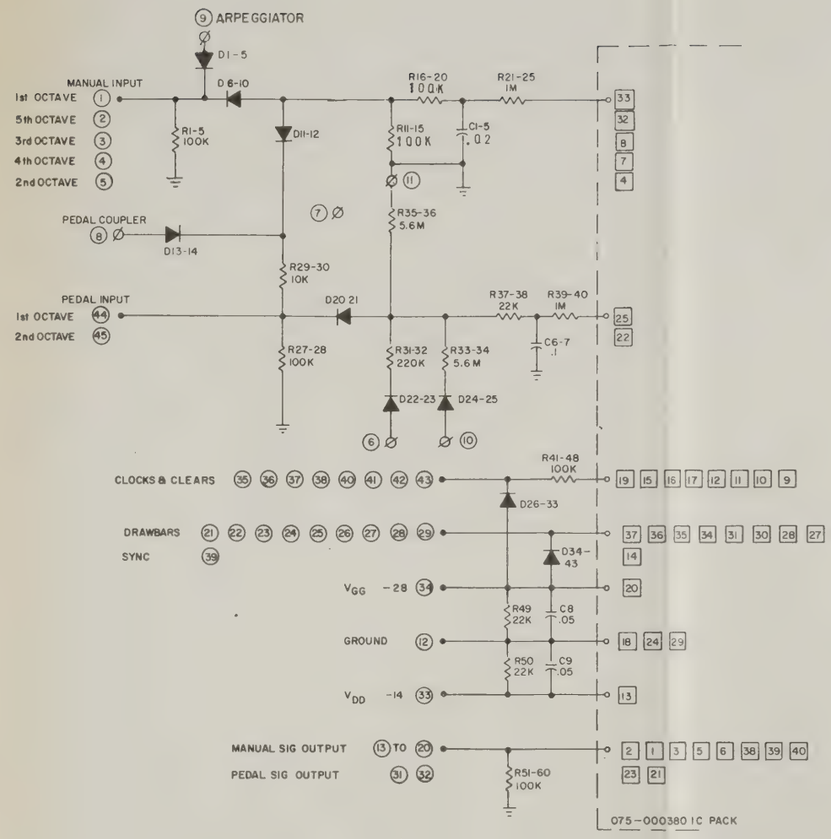


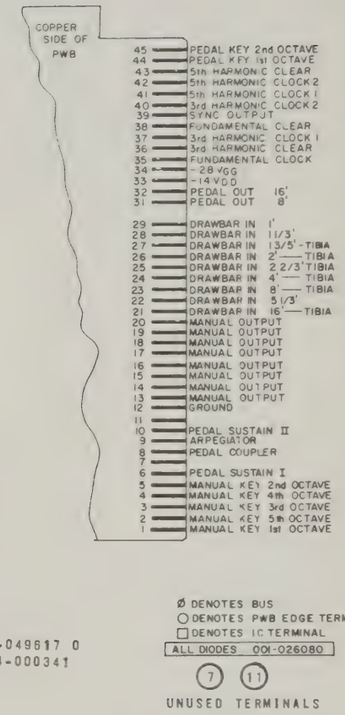
FIGURE 3-7
LOWER MANUAL SYNTHESIS MOTHER BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000223)

123-000223 LOWER MANUAL
SYNTHESIS MOTHER BOARD

The action of the Lower Manual Synthesis assembly is in many respects, the same as the other "380" components, it has some additional functions, however, such as: 1. Pedal keying, utilizing the stair-step-wave outputs on the "380" IC's. 2. Producing a pulse signal output at J109 for the synchronization of all generator keyers, and 3. Providing inputs for the Arpeggiator keyboard, (124-047850) at J117. J111 and J112 are outputs to Pedal Filter Board (124-000206). There is no synthesis or bright percussion available on the lower manual.






COPPER SIDE OF PWB
45 PEDAL KEY 2nd OCTAVE
44 PEDAL KEY 1st OCTAVE
43 5th HARMONIC CLEAR
42 5th HARMONIC CLOCK 2
41 5th HARMONIC CLOCK 1
40 3rd HARMONIC CLOCK 2
39 SYNC OUTPUT
38 FUNDAMENTAL CLEAR
37 3rd HARMONIC CLOCK 1
36 3rd HARMONIC CLEAR
35 FUNDAMENTAL CLOCK
34 -28 VGG
33 -14 VDD
32 PEDAL OUT 16'
31 PEDAL OUT 8'
29 DRAWBAR IN 1'
28 DRAWBAR IN 1 1/3'
27 DRAWBAR IN 1 3/5' - TIBIA
26 DRAWBAR IN 2' — TIBIA
25 DRAWBAR IN 2 2/3' TIBIA
24 DRAWBAR IN 4' — TIBIA
23 DRAWBAR IN 8' — TIBIA
22 DRAWBAR IN 5 1/3'
21 DRAWBAR IN 16' — TIBIA
20 MANUAL OUTPUT
19 MANUAL OUTPUT
18 MANUAL OUTPUT
17 MANUAL OUTPUT
16 MANUAL OUTPUT
15 MANUAL OUTPUT
14 MANUAL OUTPUT
13 MANUAL OUTPUT
12 GROUND
11
10 PEDAL SUSTAIN II
9 ARPEGGIATOR
8 PEDAL COUPLER
7
6 PEDAL SUSTAIN I
5 MANUAL KEY 2nd OCTAVE
4 MANUAL KEY 4th OCTAVE
3 MANUAL KEY 3rd OCTAVE
2 MANUAL KEY 5th OCTAVE
1 MANUAL KEY 1st OCTAVE

094-049617 0
124-000341

Ø DENOTES BUS
○ DENOTES PWB EDGE TERMINAL
□ DENOTES IC TERMINAL
ALL DIODES 001-026080
7 11
UNUSED TERMINALS

5

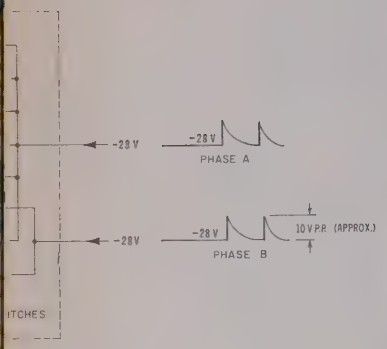
124-000341 - LOWER MANUAL MOTHER AND DAUGHTER BOARD ASSEMBLY -

The 380 Divider and Keyer Assembly provides 9 pitches of square waves for each of 61 manual keys plus 2 pitches of staircase waves for each of 25 pedal keys. In addition 12 sync. pulses are provided for ensuring that additional sets of generating keyers are locked proper phase relationship.

The assembly consists of 13, 380 daughter boards (124-000341) combined with a mother board assembly (124-000223. All daughter boards are identical and service 5 octavely related keys. Note that there are 2 "C" boards to provide for the top "C" on the manual. Therefore, the key nos. 13, 25 and 49 appear in duplicate. In actual use only 1 note is cabled to the organ.

A) Power is supplied through J109-13, 14 & 15.
B) Manual Key Inputs: J114, J115 & J116.
C) Pedal Key Inputs: J111 & J112.
D) Drawbar Voltage Inputs: J108-4 through 12.
E) Top Octave (Clock) Inputs: J110-1 through 13.
F) Square Wave outputs: J113 & J108.
G) Staircase Outputs: (Pedal) J108-2 & 3.
H) Sync. Outputs: J109-1 through 12.
J) Arpeggiator Outputs: J117.

FIGURE 3-8
LOWER MANUAL SYNTHESIS
DAUGHTER BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000341)

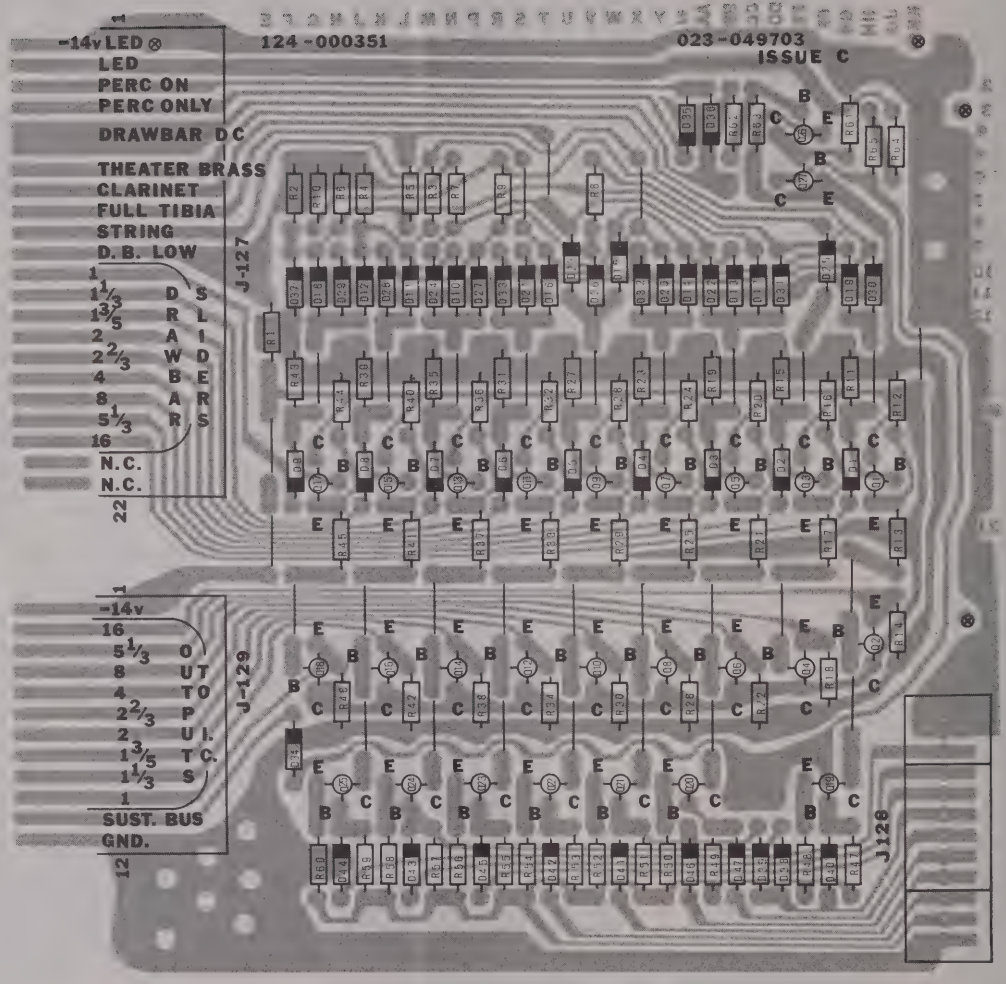


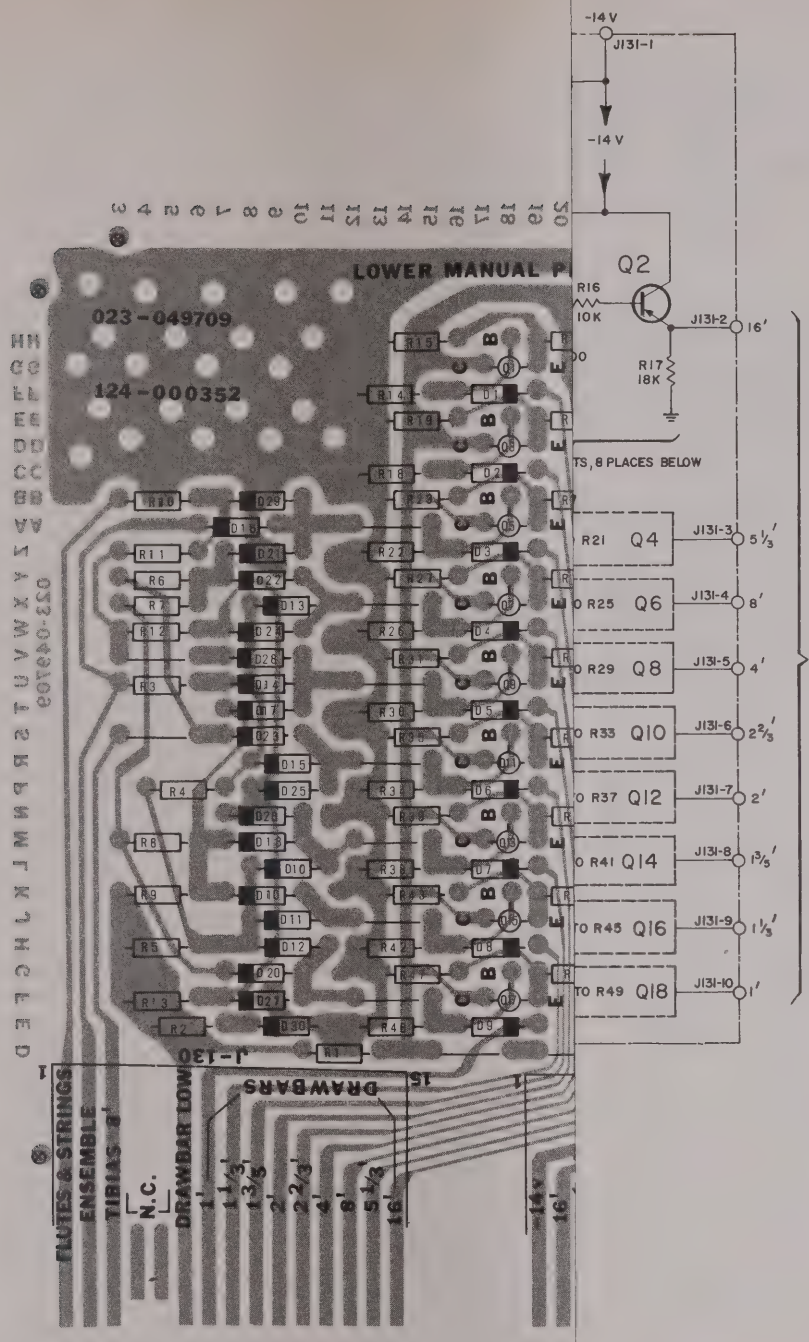
NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10 %.
2. SYMBOL "○" INDICATES EDGE CONNECTOR PIN AND IT'S NUMBER.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
20	Q1 THRU Q18 & Q26,Q27	001-021172	2N 4249
7	Q19 THRU Q25	001-021134	2N 3394
47	D1 THRU D47	001-026080	1N 4148

REVISIONS	
A R64 AND R65 WERE 150 OHMS.	





QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
18	Q1 THRU Q18	001-021172	2N 4249
30	D1 THRU D30	001-026080	IN 4148

REVISIONS

NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%.
2. SYMBOL —○ INDICATES EDGE CONNECTOR, PIN & IT'S NO, LOCATED IN ONE OF THE TWO EDGE CONNECTORS: J130 OR J131.
3. ALL SWITCHES ARE IN "OFF" POSITION.

7

tained. Q2
divider key-
f 9 tonebars

applied to
30-1) various
esistors R10,
through diodes
wers which in
to control the
presets func-

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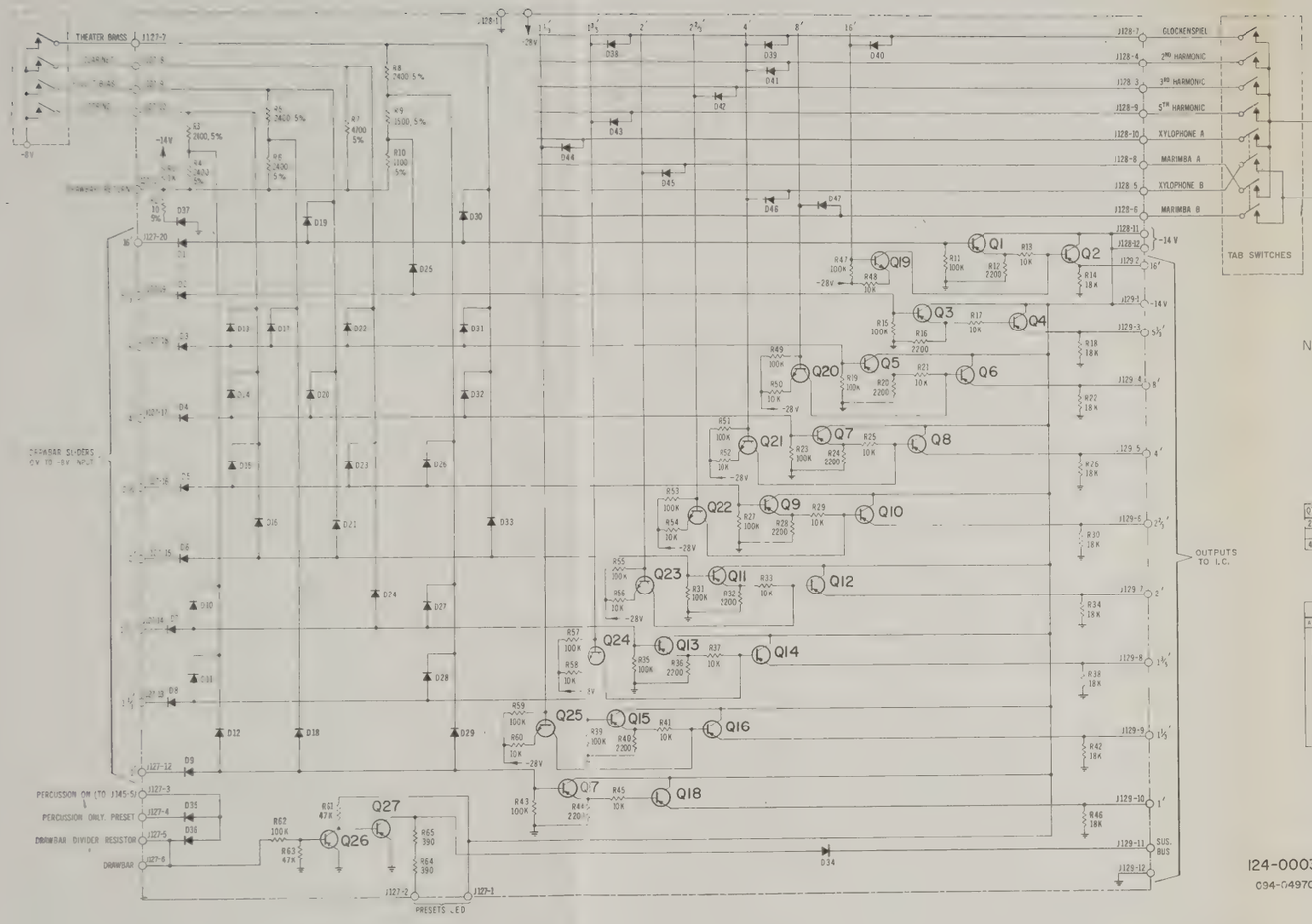
ar divider re-
ect levels be-

FIGURE 3-10
LOWER MANUAL PRESET BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000352)



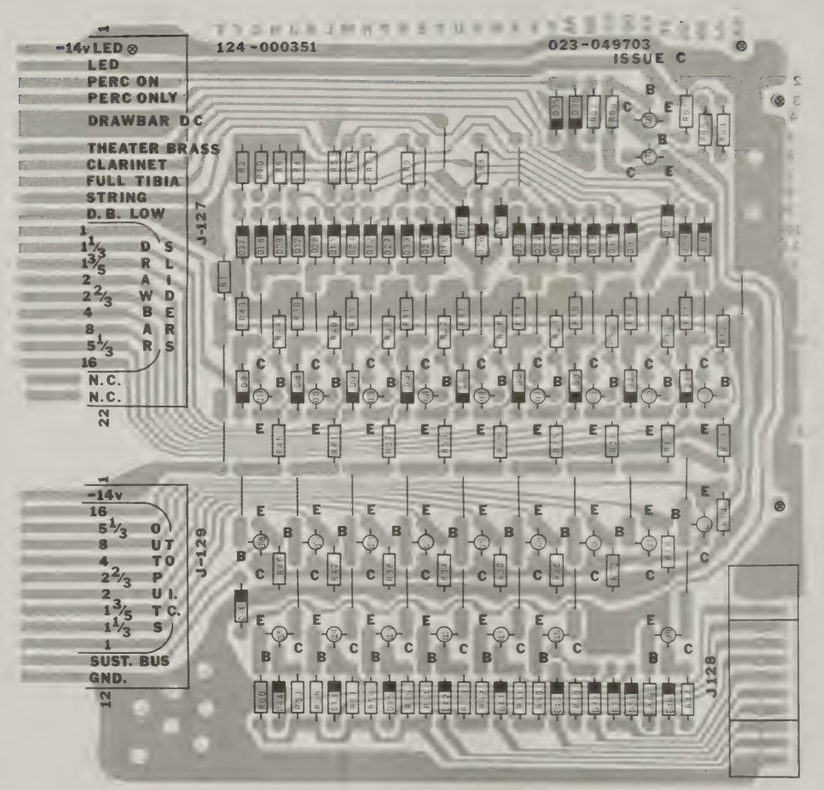
NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%.
2. SYMBOL "○" INDICATES EDGE CONNECTOR PIN AND IT'S NUMBER.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
20	Q1 THRU Q18 & Q26,Q27	001-021172	2N 4249
7	Q19 THRU Q25	001-021134	2N 3394
47	D1 THRU D47	001-026080	1N 4148

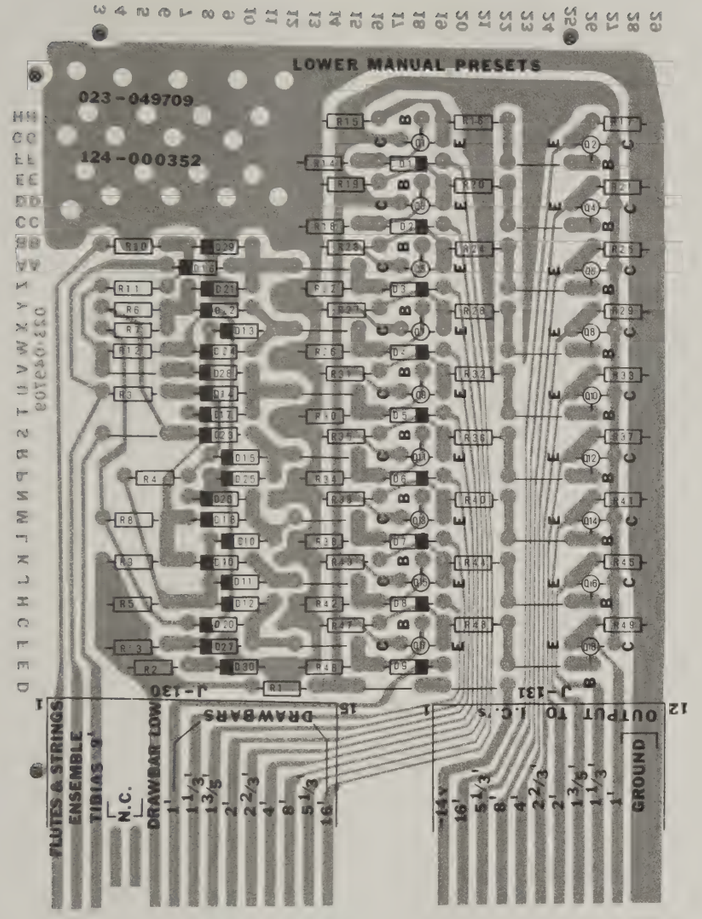
REVISIONS	
ALL RES. ARE 750 WATT 10 OHMS	

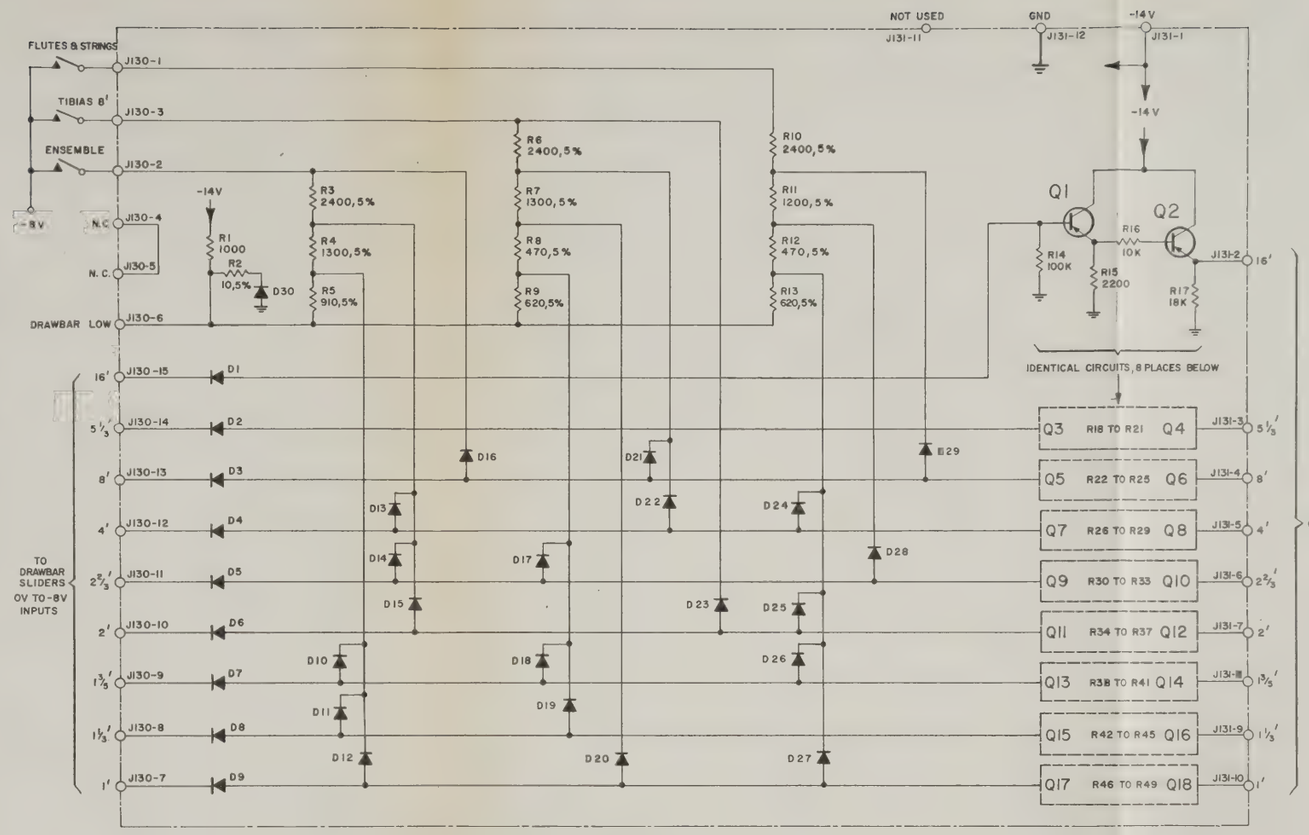
124-000351
C94-049707-A



6

FIGURE 3-9
UPPER MANUAL PRESET BOARD
SCHEMATIC AND LAYOUT
(124-000351)





QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
18	Q1 THRU Q18	001-021172	2N 4249
30	D1 THRU D30	001-026080	IN 4148

REVISIONS

NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%.
2. SYMBOL —○ INDICATES EDGE CONNECTOR, PIN # IT'S NO, LOCATED IN ONE OF THE TWO EDGE CONNECTORS: J130 OR J131.
3. ALL SWITCHES ARE IN "OFF" POSITION.

LOWER MANUAL PRESETS
124-000352
094-049713-0

7

LOWER MANUAL PRESET BOARDS 124-000352

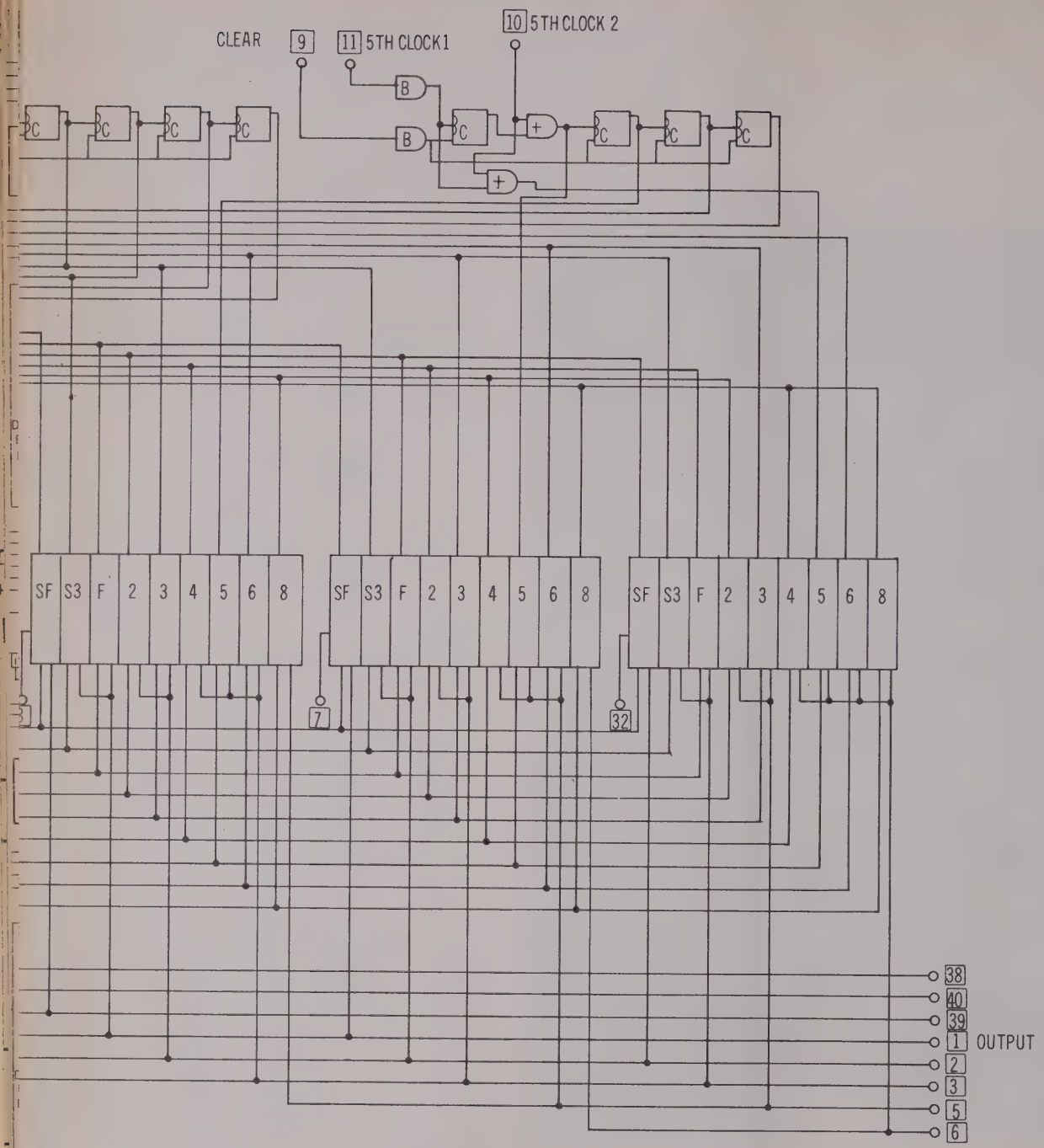
The lower manual preset board is used in LSI organ Models to provide 9 variable output voltages to control the amplitude of 9 harmonics available from the I.C. divider keyers. The magnitude of each of the 9 voltages may be individually controlled by the settings of the corresponding tonebars, or combinations of output voltages can be selected by the application of a control voltage (-8 typical) to anyone of three preset inputs.

DRAWBAR INPUTS - A voltage that varies from 0 to -8 volts, as determined by the setting of the 16' drawbar is applied to J130-15. This negative voltage appears at the base of emitter follower Q1. Q1 and Q2 are used in cascade to provide the same number of active elements in this circuit as are present in the upper manual circuit. By this technique, tracking of the upper and lower manual drawbars is maintained. Q2 provides a low impedance output to the I.C. divider keyer package. The voltage output from each of 9 tonebars is handled in a similar manner.

PRESET INPUTS - When a negative voltage is applied to the "Flutes and Strings" input (terminal J130-1) various voltage levels are established by divider resistors R10, R11, R12, R13. These voltages are applied through diodes D24 thru D29 to the inputs of emitter followers which in turn provide low impedance output voltages to control the appropriate musical pitches. The other two presets function in a similar manner.

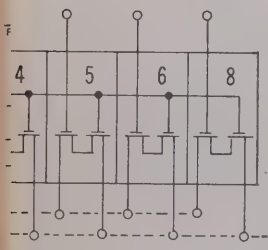
BIAS VOLTAGE - Resistors R1, R2 and diode D30 provide a small bias voltage for the preset and drawbar divider resistors. This bias helps maintain the correct levels between drawbar positions 1 thru 8.

FIGURE 3-10
LOWER MANUAL PRESET BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000352)



V_{DD} 13
V_{GG} 20
GND 18

ACTUAL PIN CONNECTIONS ☐

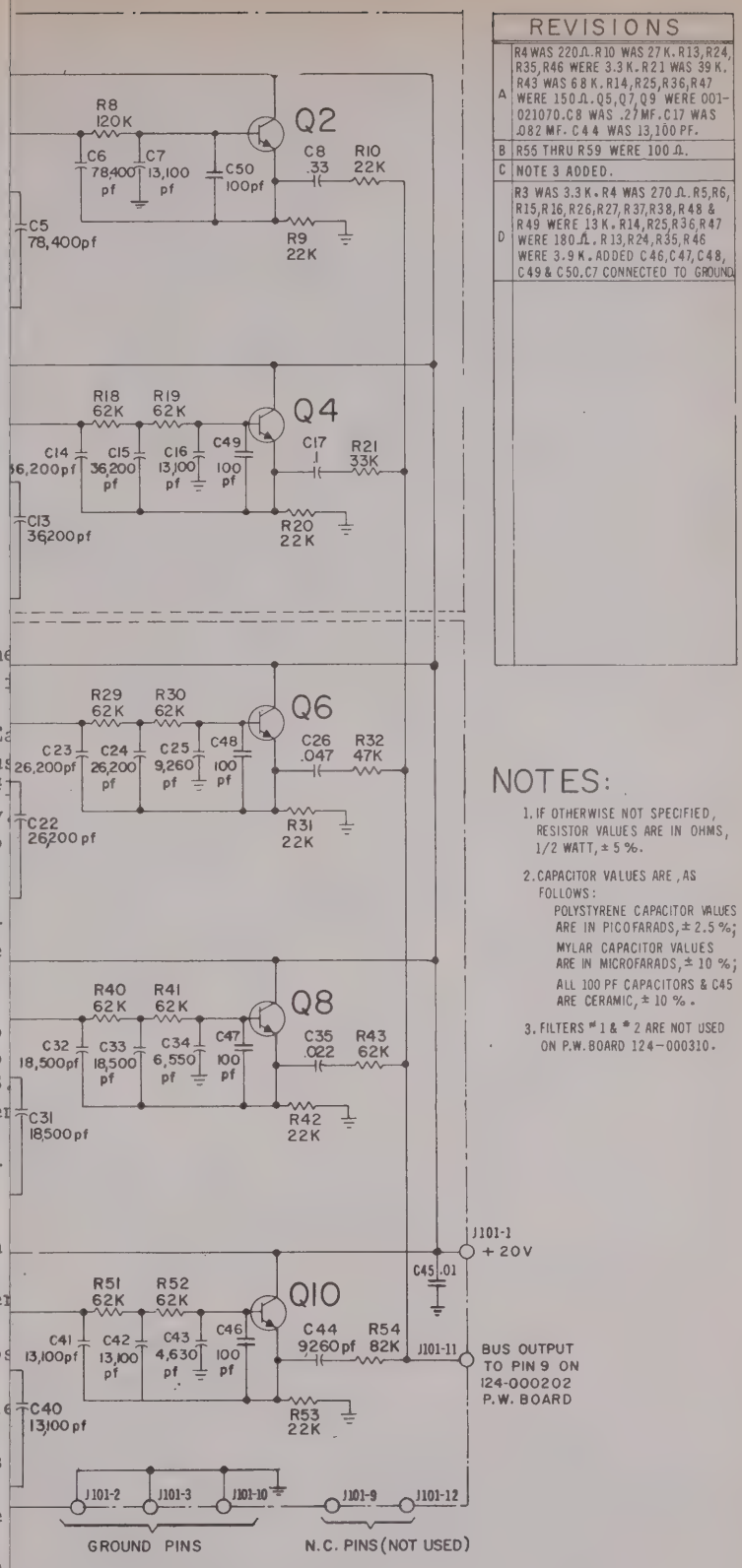


094-000380—D

124-000201, 124-000202, 124-000204.

SINE WAVE FILTER BOARDS.

These printed wiring boards work togethe as a unit. There are 14 filter groups each set to match the 14 signal output terminals of a typical 380 assembly. Ea group passes one 12 interval octave plus one note, with the exception of group #1 which is for frequency #1 thru #12 only. Pass bands of the filter groups overlap by necessity due to the combination of pitches on the 380 outputs. A total range of 8 octaves is available. (frequency #1 thru #97). On the first five groups, a 150 ohm resistor is used at the input to develop the square wave output current from the 380 keyers into a signal of approximately 80 mv peak to peak for one note at tonebar position 8. On all remaining groups the keyer curre is summed in a bus amplifier input of very low impedance (10 ohms). The output current at the collector of this stage is the same amplitude as is developed across the 150 ohm resistors on the first five groups. The bus amp is used to prevent IM distortion from inter action between the IC keyers. It is not needed on the lower frequency groups because the IM difference frequencies are most sub-audible. Most of the filte groups are two stage, 8 pole, active band-pass filters. The first stage has a pronounced peak near the top of the pass band. The second stage starts the roll-off just above the low end of the pass band, a combination which provides a reasonably flat pass-band with a shar attenuation curve. Input and output cou ling capacitors are used to reduce keyin thumps by providing low frequency roll-o Filter group #1 has one RC section delet as the sine wave purity requirements are not as severe at low frequencies. Filte group #14 has only one stage since the harmonics are at the upper limit of hear ing. All signals from the 124-000201 an 124-000204 boards go to the 124-000202 board where Q13, a phase diverter, sums the outputs of groups one thru five whic do not have bus amplifiers. The remaining signals along with those from the



REVISIONS	
A	R4 WAS 220Ω. R10 WAS 27K. R13, R24, R35, R46 WERE 3.3K. R21 WAS 39K. R43 WAS 68K. R14, R25, R36, R47 WERE 150Ω. Q5, Q7, Q9 WERE 001-021070. C8 WAS .27 MF. C17 WAS .082 MF. C44 WAS 13,100 PF.
B	R55 THRU R59 WERE 100Ω.
C	NOTE 3 ADDED.
D	R3 WAS 3.3K. R4 WAS 270Ω. R5, R6, R15, R16, R26, R27, R37, R38, R48 & R49 WERE 13K. R14, R25, R36, R47 WERE 180Ω. R13, R24, R35, R46 WERE 3.9K. ADDED C46, C47, C48, C49 & C50. C7 CONNECTED TO GROUND.

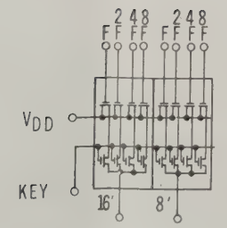
NOTES:

1. IF OTHERWISE NOT SPECIFIED, RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ± 5 %.
2. CAPACITOR VALUES ARE, AS FOLLOWS:
   POLYSTYRENE CAPACITOR VALUES ARE IN PICOFARADS, ± 2.5 %;
   MYLAR CAPACITOR VALUES ARE IN MICROFARADS, ± 10 %;
   ALL 100 PF CAPACITORS & C45 ARE CERAMIC, ± 10 %.
3. FILTERS #1 & #2 ARE NOT USED ON P.W. BOARD 124-000310.

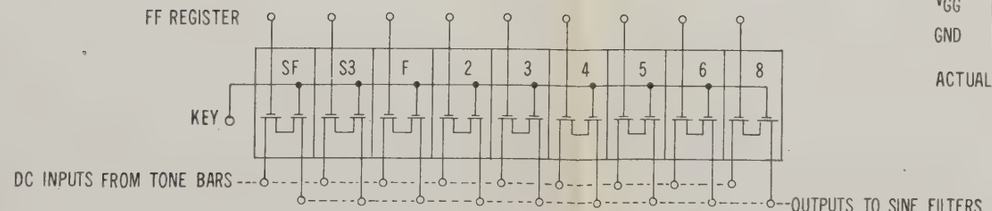
HAMMOND PART NO.	JEDEC PART NO.
001-021260	2N5826
001-021135	2N3394

124-000310
45849-D

FIGURE 3-12
SINE WAVE FILTER #1
SCHEMATIC, LAYOUT AND
THEORY (124-000201)



TYPICAL PEDAL KEYING BLOCK



TYPICAL SYNTHESIS KEYING BLOCK

VDD 13
VGG 20
GND 18

ACTUAL PIN CONNECTIONS ☐

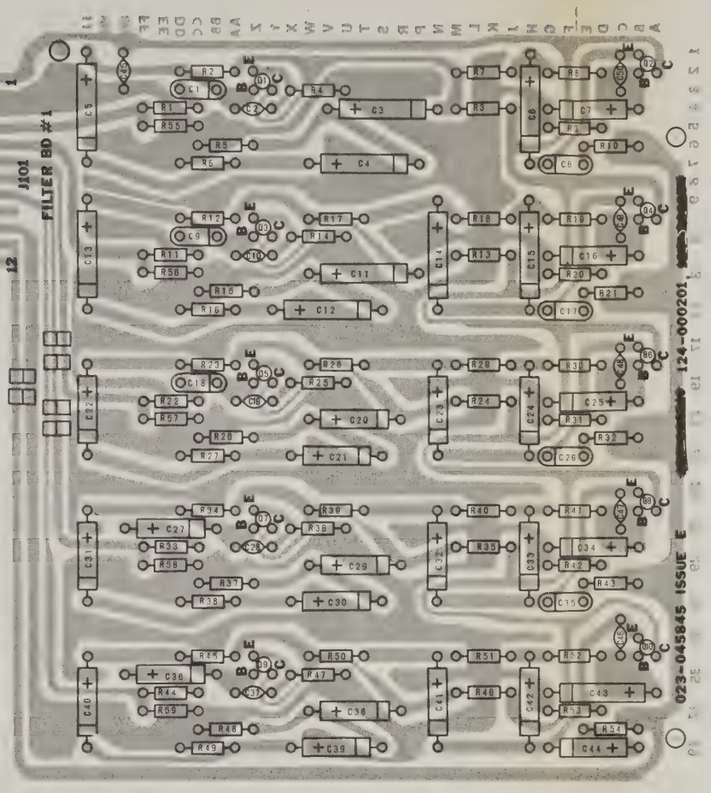
094-000380—D

FIGURE 3-11
I.C. 380 DIVIDER KEYER PACKAGE
SCHEMATIC
(075-000380)

124-000201, 124-000202, 124-000204.

SINE WAVE FILTER BOARDS.

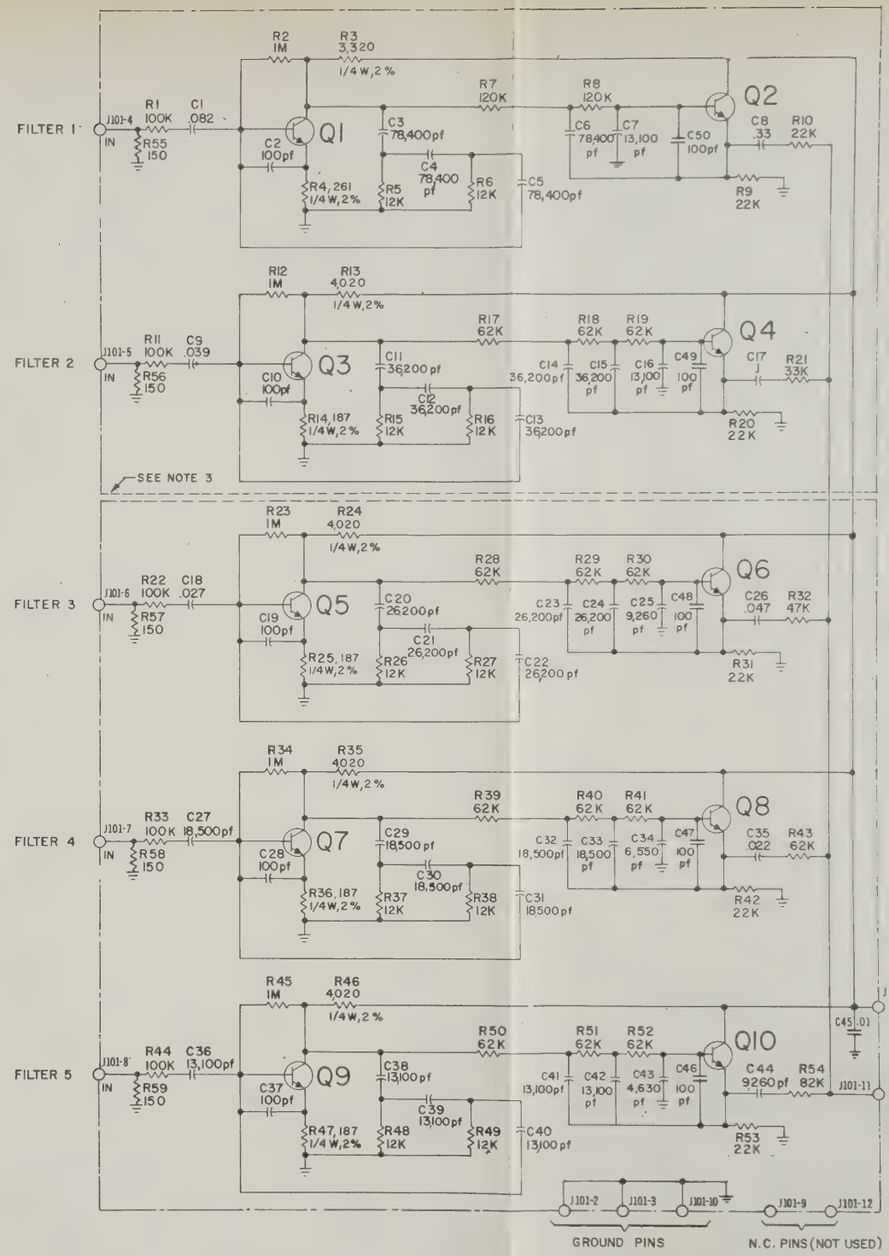
These printed wiring boards work together as a unit. There are 14 filter groups in each set to match the 14 signal output terminals of a typical 380 assembly. Each group passes one 12 interval octave plus one note, with the exception of group #1, which is for frequency #1 thru #12 only. Pass bands of the filter groups overlap by necessity due to the combination of pitches on the 380 outputs. A total range of 8 octaves is available. (frequency #1 thru #97). On the first five groups, a 150 ohm resistor is used at the input to develop the square wave output current from the 380 keyers into a signal of approximately 80 mv peak to peak for one note at tonebar position 8. On all remaining groups the keyer current is summed in a bus amplifier input of very low impedance (10 ohms). The output current at the collector of this stage is the same amplitude as is developed across the 150 ohm resistors on the first five groups. The bus amp is used to prevent IM distortion from interaction between the IC keyers. It is not needed on the lower frequency groups because the IM difference frequencies are most sub-audible. Most of the filter groups are two stage, 8 pole, active band-pass filters. The first stage has a pronounced peak near the top of the pass band. The second stage starts the roll-off just above the low end of the pass band, a combination which provides a reasonably flat pass-band with a sharp attenuation curve. Input and output coupling capacitors are used to reduce keying thumps by providing low frequency roll-off. Filter group #1 has one RC section deleted as the sine wave purity requirements are not as severe at low frequencies. Filter group #14 has only one stage since the harmonics are at the upper limit of hearing. All signals from the 124-000201 and 124-000204 boards go to the 124-000202 board where Q13, a phase diverter, sums the outputs of groups one thru five which do not have bus amplifiers. The remaining signals along with those from the



phase inverter feed into Q14, an output amp on the 124-000202 board. Mixing resistors in the output of each filter group are selected to provide the necessary tapering. (Higher output at lower frequencies).

TVI suppression capacitors are provided and isolating resistors are used to prevent failure of the output amp or the phase inverter.

NOTE: Earlier versions of these boards do not have TVI suppression capacitors of isolation resistors.



REVISIONS	
A	R4 WAS 220Ω. R10 WAS 27K. R13, R24, R35, R46 WERE 3.3K. R21 WAS 39K. R43 WAS 68K. R14, R25, R36, R47 WERE 150Ω. Q5, Q7, Q9 WERE 001-021070. C8 WAS .27MF. C17 WAS .082 MF. C44 WAS 13,100 PF.
B	R55 THRU R59 WERE 100Ω.
C	NOTE 3 ADDED.
D	R3 WAS 3.3K. R4 WAS 270Ω. R5, R6, R15, R16, R26, R27, R37, R38, R48 & R49 WERE 13K. R14, R25, R36, R47 WERE 180Ω. R13, R24, R35, R46 WERE 3.9K. ADDED C46, C47, C48, C49 & C50. C7 CONNECTED TO GROUND.

NOTES:

1. IF OTHERWISE NOT SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ± 5%.
2. CAPACITOR VALUES ARE, AS FOLLOWS:
   POLYSTYRENE CAPACITOR VALUES ARE IN PICOFARADS, ± 2.5%;
   MYLAR CAPACITOR VALUES ARE IN MICROFARADS, ± 10%;
   ALL 100 PF CAPACITORS & C45 ARE CERAMIC, ± 10%.
3. FILTERS #1 & #2 ARE NOT USED ON P.W. BOARD 124-000310.

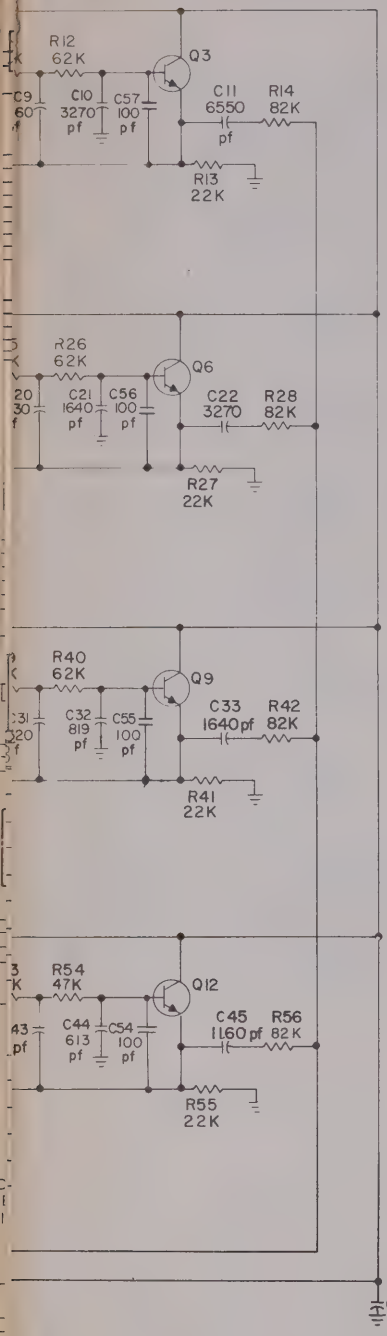
QTY	DESIGNATION SYMBOL	HAMMOND PART NO	JEDEC PART NO
5	Q1, Q3, Q5, Q7, Q9	001-021260	2N5826
5	Q2, Q4, Q6, Q8, Q10	001-021135	2N3394

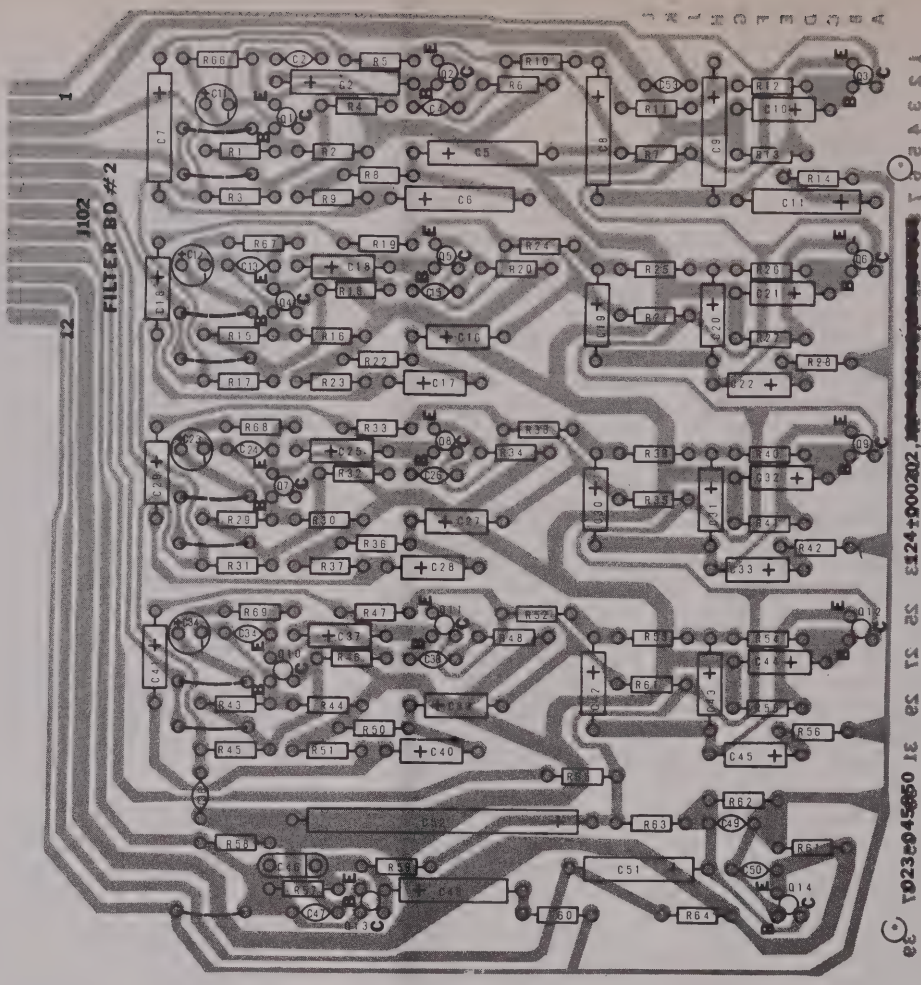
124-000201/124-000310

094-045849-D

FIGURE 3-12
SINE WAVE FILTER #1
SCHEMATIC, LAYOUT AND
THEORY (124-000201)

LTERS





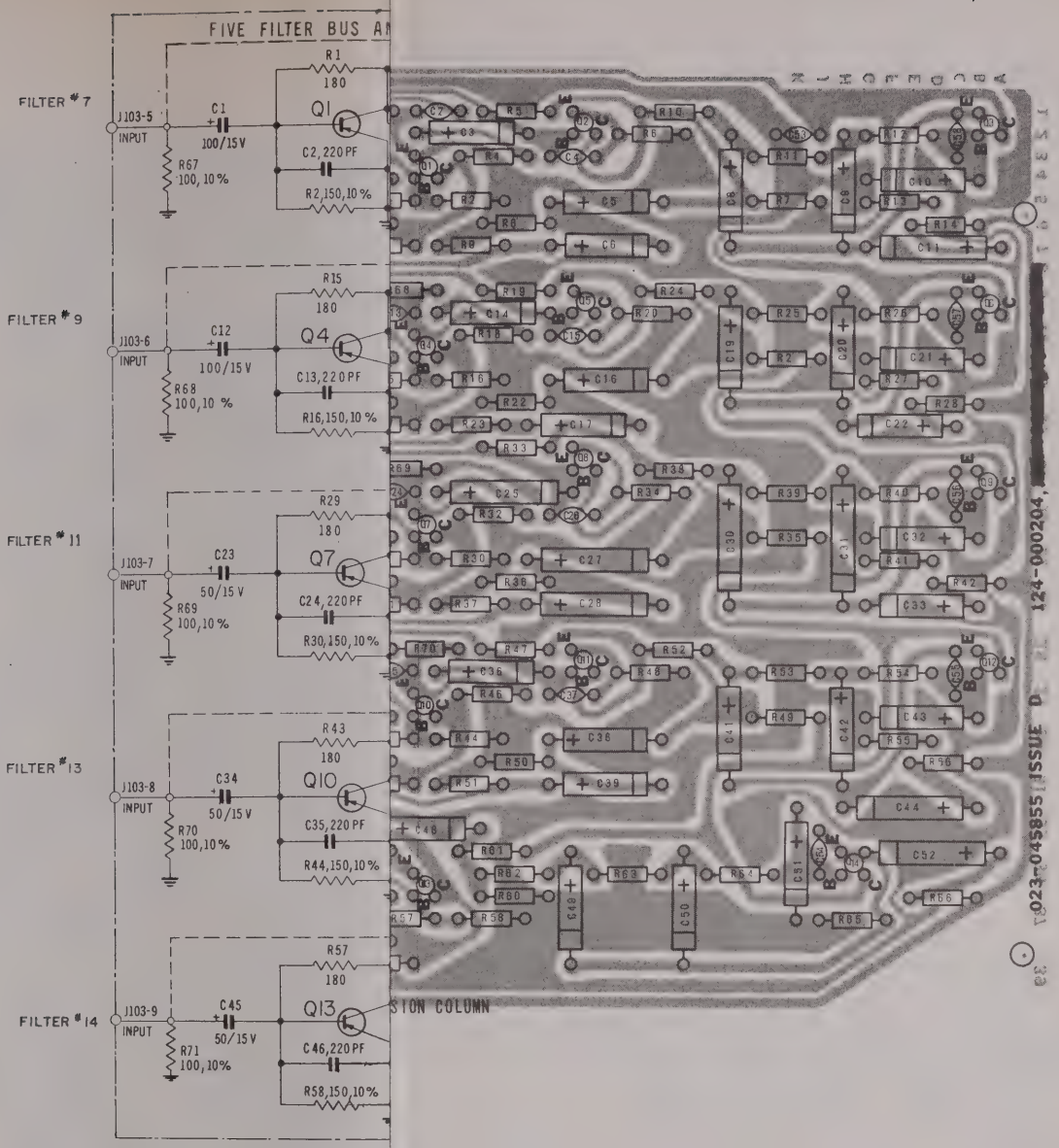
NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±5%.
2. MYLAR CAPACITOR VALUES, ±10 % AND ELECTROLYTIC CAPACITOR VALUES, SHOWN WITH WORKING VOLTAGE, ARE IN MICROFARADS.
3. POLYSTYRENE CAPACITOR VALUES ARE IN PICOFARADS, ± 2.5%.
4. CAPACITORS WITH VALUES OF 100PF, 200 PF AND C53 ARE CERAMIC, ± 10 %.

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
4	Q1, Q4, Q7, Q10	001-021172	2N 4249
6	Q2, Q5, Q8, Q11, Q13, Q14	001-021260	2N5826
4	Q3, Q6, Q9, Q12	001-021135	2N 3394

REVISIONS			
A	"SPINETS ONLY" DELETED FROM NOTE 2.	D	WERE 13K. R70 & R71 ADDED. Q13 & Q14 WERE 001-021135.
B	R2, R16, R30 & R44 WERE 120Ω. R7, R21, R35 & R49 WERE 3.3 K. R6, R20 & R34 WERE 150 Ω. R48 WAS 130Ω. R61 WAS 6800Ω. R62 WAS 82 K. Q2, Q5, Q8, Q11 WERE 001-021070. C49 WAS 100 PF. C11 WAS 9260 PF. C22 WAS 4630 PF. C33 WAS 2320 PF.		
C	R1, R15, R29 & R43 WERE 120Ω. R2, R16, R30 & R44 WERE 330Ω.		
D	ADDED C54 THRU C58. R6, R20, R34 & R48 WERE 180Ω. R7, R21, R35 & R49 WERE 3.9 K. R8, R9, R22, R23, R36, R37, R50 & R51		

RATION

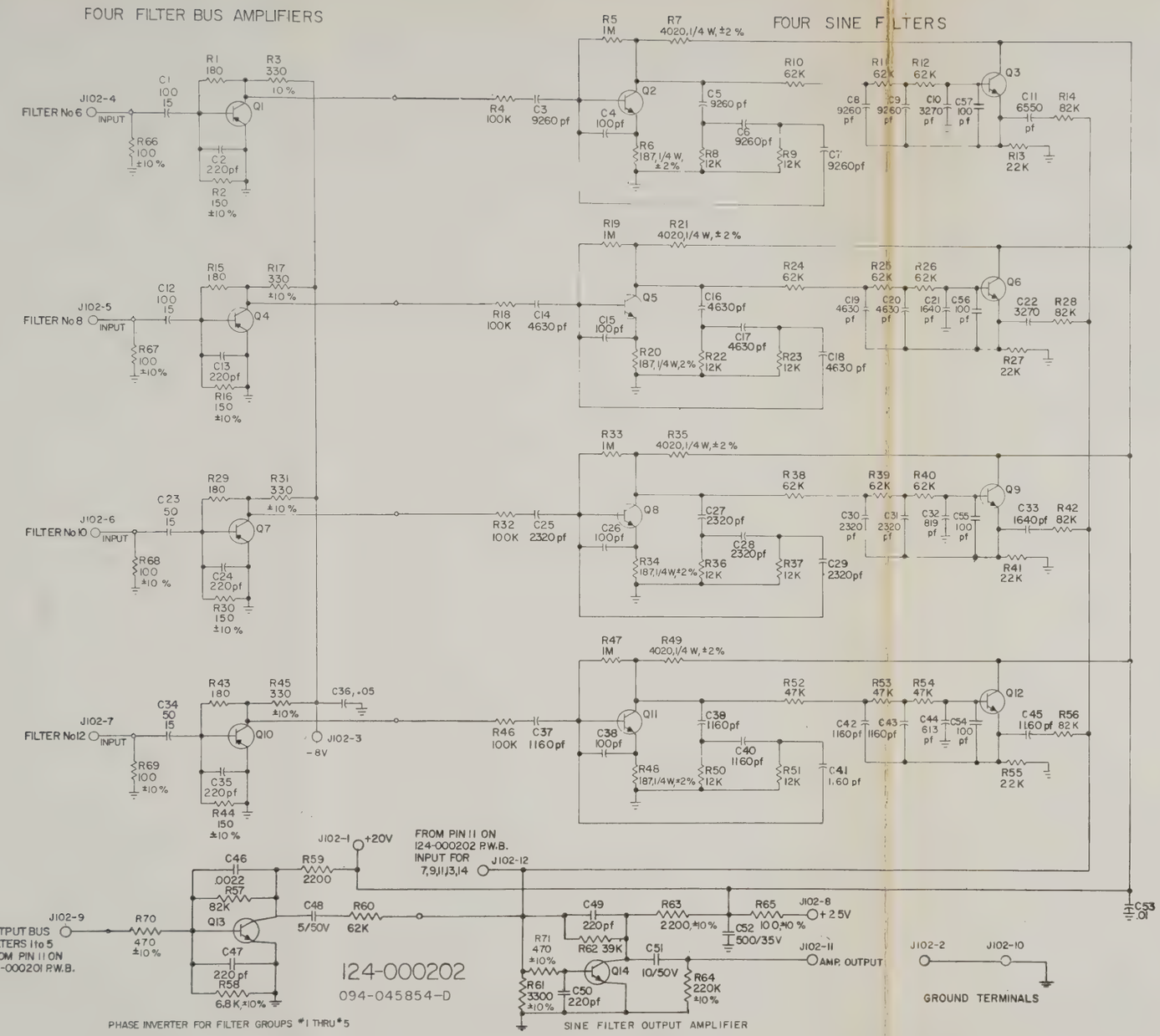


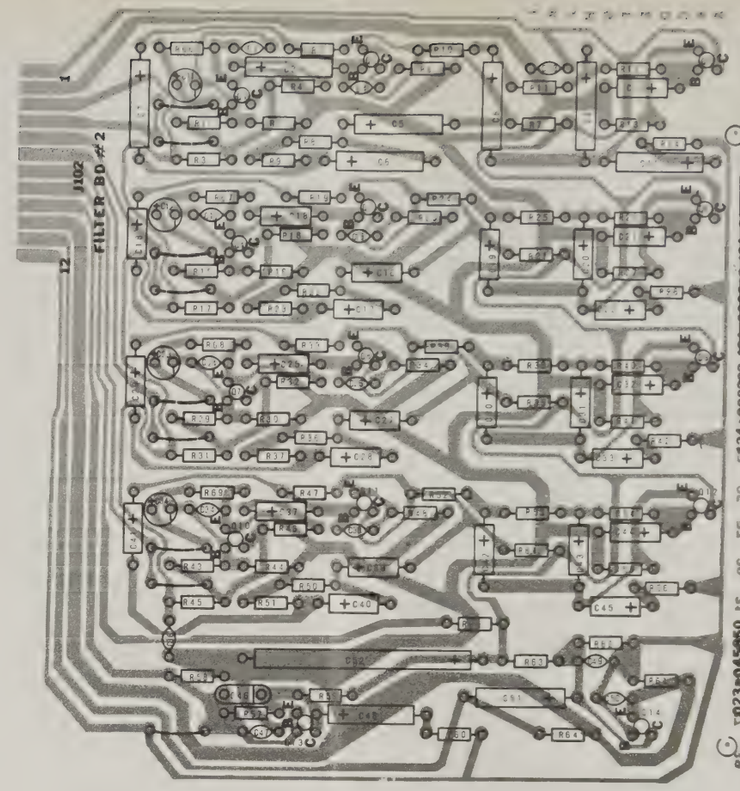
NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±5 %.
2. CAPACITOR VALUES ARE AS FOLLOWS:
   MYLAR CAPACITORS, ± 10 % AND ELECTROLYTIC CAPACITORS WITH THEIR VALUES AND WORKING VOLTAGES SHOWN, ARE IN MICROFARADS;
   POLYSTYRENE CAPACITOR VALUES ARE IN PICOFARADS, ± 2.5 %;
   C53 AND ALL 100 PF & 220 PF CAPACITORS ARE CERAMIC, ± 10 %.

10

FIGURE 3-14
SINE FILTER #3
SCHEMATIC, LAYOUT
AND THEORY
(124-000204)





NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±5%.
2. MYLAR CAPACITOR VALUES, ±10 % AND ELECTROLYTIC CAPACITOR VALUES, SHOWN WITH WORKING VOLTAGE, ARE IN MICROFARADS.
3. POLYSTYRENE CAPACITOR VALUES ARE IN PICOFARADS, ± 2.5%.
4. CAPACITORS WITH VALUES OF 100 PF, 200 PF AND C53 ARE CERAMIC, ± 10 %.

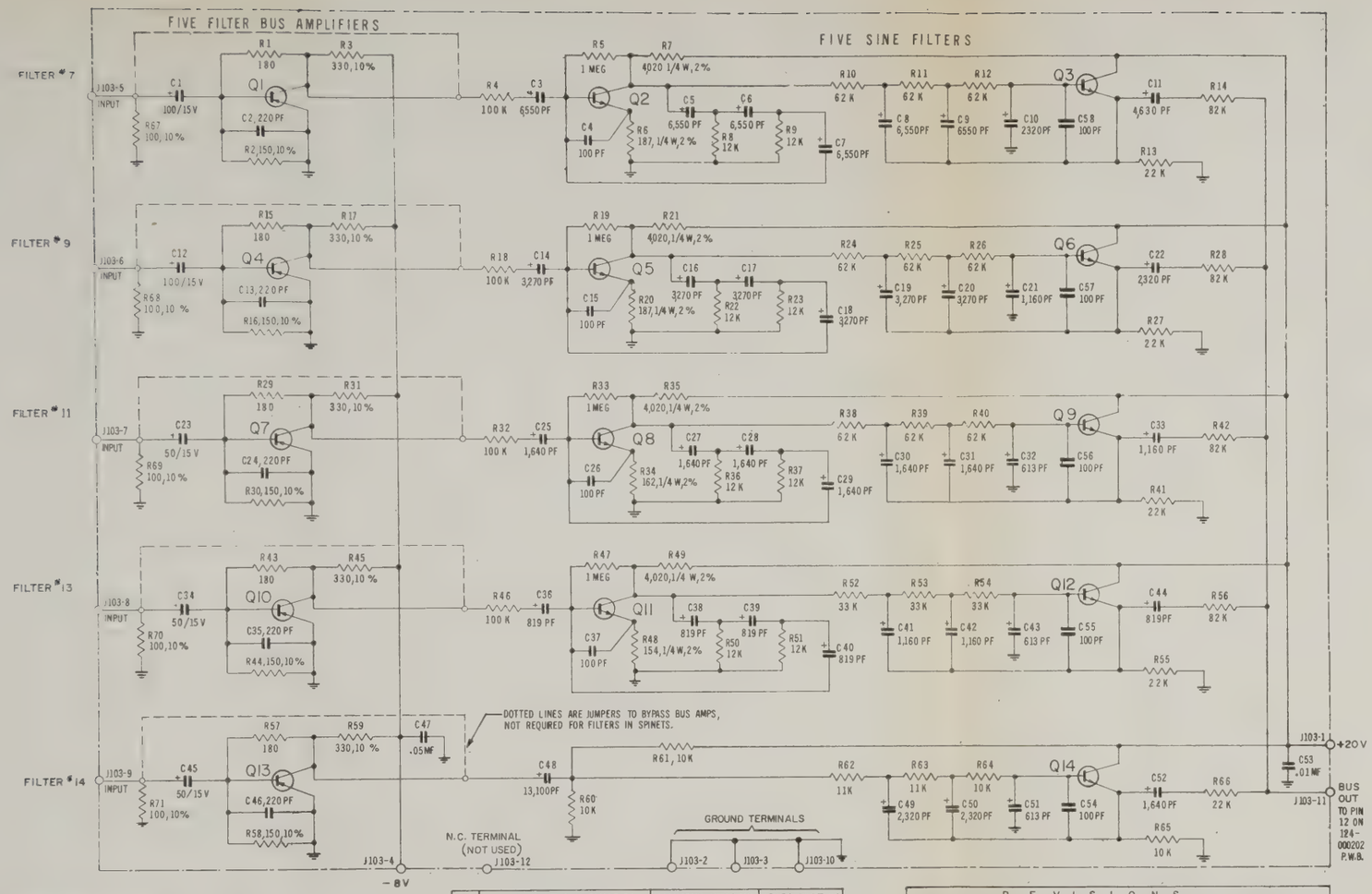
QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
4	Q1, Q4, Q7, Q10	001-021172	2N 4249
6	Q2, Q5, Q8, Q11, Q13, Q14	001-021260	2N 5826
4	Q3, Q6, Q9, Q12	001-021135	2N 3394

REVISIONS			
A	"SPINETS ONLY" DELETED FROM NOTE 2.	D	WERE 13K. R70 & R71 ADDED. Q13 & Q14 WERE 001-021135.
B	R2, R16, R30 & R44 WERE 120 Ω. R7, R21, R35 & R49 WERE 3.3 K. R6, R20 & R34 WERE 150 Ω. R48 WAS 130 Ω. R61 WAS 6800 Ω. R62 WAS 82 K. Q2, Q5, Q8, Q11 WERE 001-021070. C49 WAS 100 PF. C11 WAS 9260 PF. C22 WAS 4630 PF. C33 WAS 2320 PF.		
C	R1, R15, R29 & R43 WERE 120 Ω. R2, R16, R30 & R44 WERE 330 Ω.		
D	ADDED C54 THRU C58. R6, R20, R34 & R48 WERE 180 Ω. R7, R21, R35 & R49 WERE 3.9 K. R8, R9, R22, R23, R36, R37, R50 & R51		

9

FIGURE 3-13
SINE WAVE FILTER #2
SCHEMATIC, LAYOUT
AND THEORY
(124-000202)

NOTE: FOR 124-000202 THEORY OF OPERATION
SEE FIG. 3-12



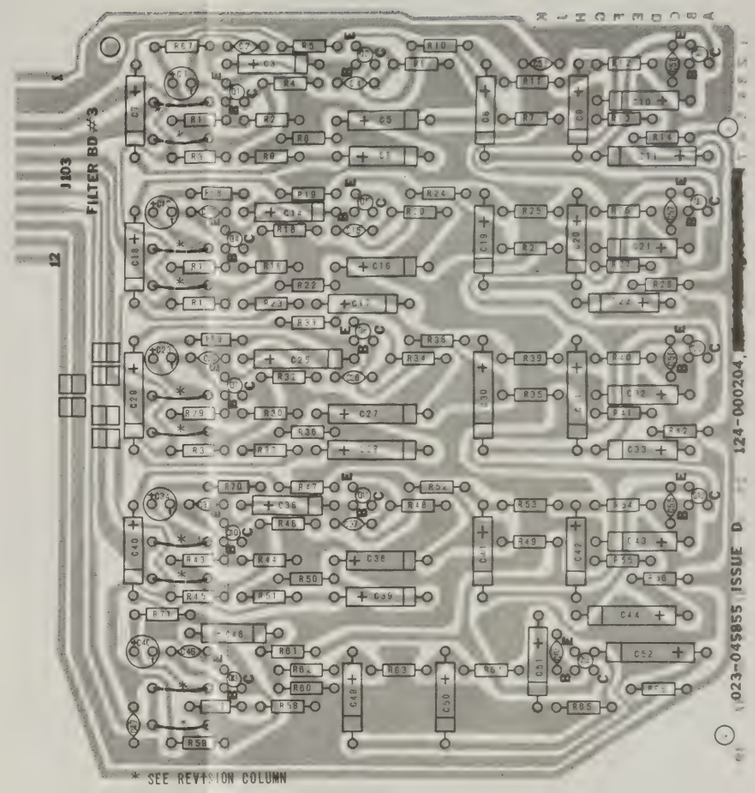
NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±5 %.
2. CAPACITOR VALUES ARE AS FOLLOWS:
   MYLAR CAPACITORS, ± 10 % AND ELECTROLYTIC CAPACITORS WITH THEIR VALUES AND WORKING VOLTAGES SHOWN, ARE IN MICROFARADS;
   POLYSTYRENE CAPACITOR VALUES ARE IN PICOFARADS, ± 2.5 %;
   C53 AND ALL 100 PF & 220 PF CAPACITORS ARE CERAMIC, ± 10 %.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
5	Q1,Q4,Q7,Q10,Q13	001-021172	2N4249
4	Q2,Q5,Q8,Q11	001-021260	2N5826
5	Q3,Q6,Q9,Q12,Q14	001-021135	2N3394

124-000204/124-000205
094-045859-C

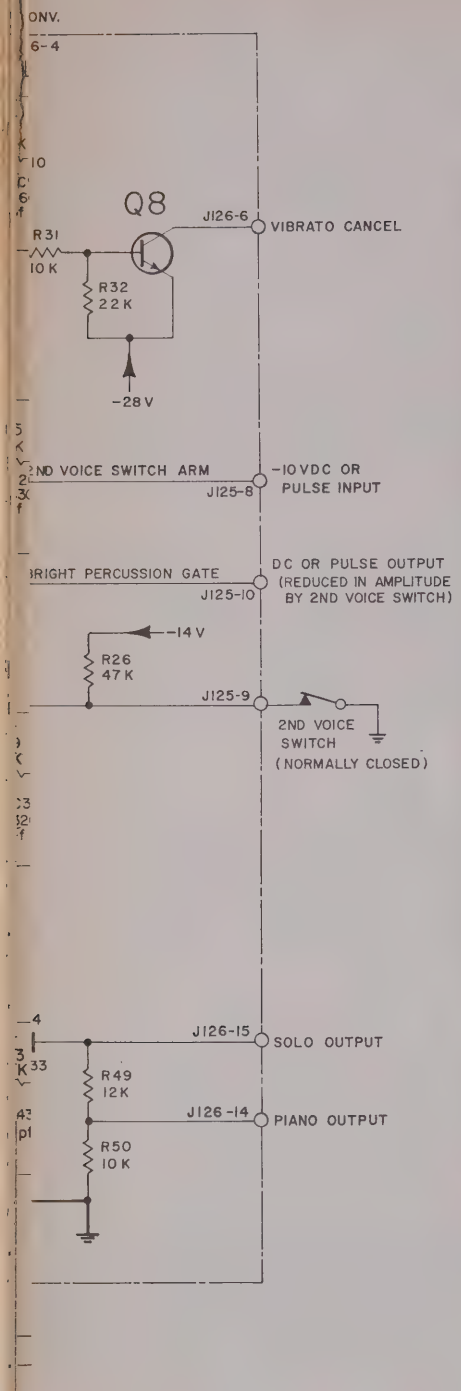
REVISIONS			
A	R2,R16,R30,R44,R58 WERE 120Ω. R7,R21,R35,R49 WERE 3.3 K. R6,R20,R34 WERE 150Ω. R48 WAS 120Ω. Q2,Q5,Q8,Q11 WERE 001-021070. C11 WAS 4,630 PF. C22 WAS 3,270 PF. C33 WAS 1,160 PF.	C	R21,R35,R49 WERE 3.9 K. R34 WAS 160Ω. R48 WAS 150Ω. R8,R9,R22,R23,R36,R37, R50,R51 WERE 13 K.
B	R1,R15,R29,R43,R57 WERE 120Ω. R2,R16,R30, R44,R58 WERE 330Ω.		
C	ADDED C54 THRU C58. R6 & R20 WERE 180Ω. R7,		

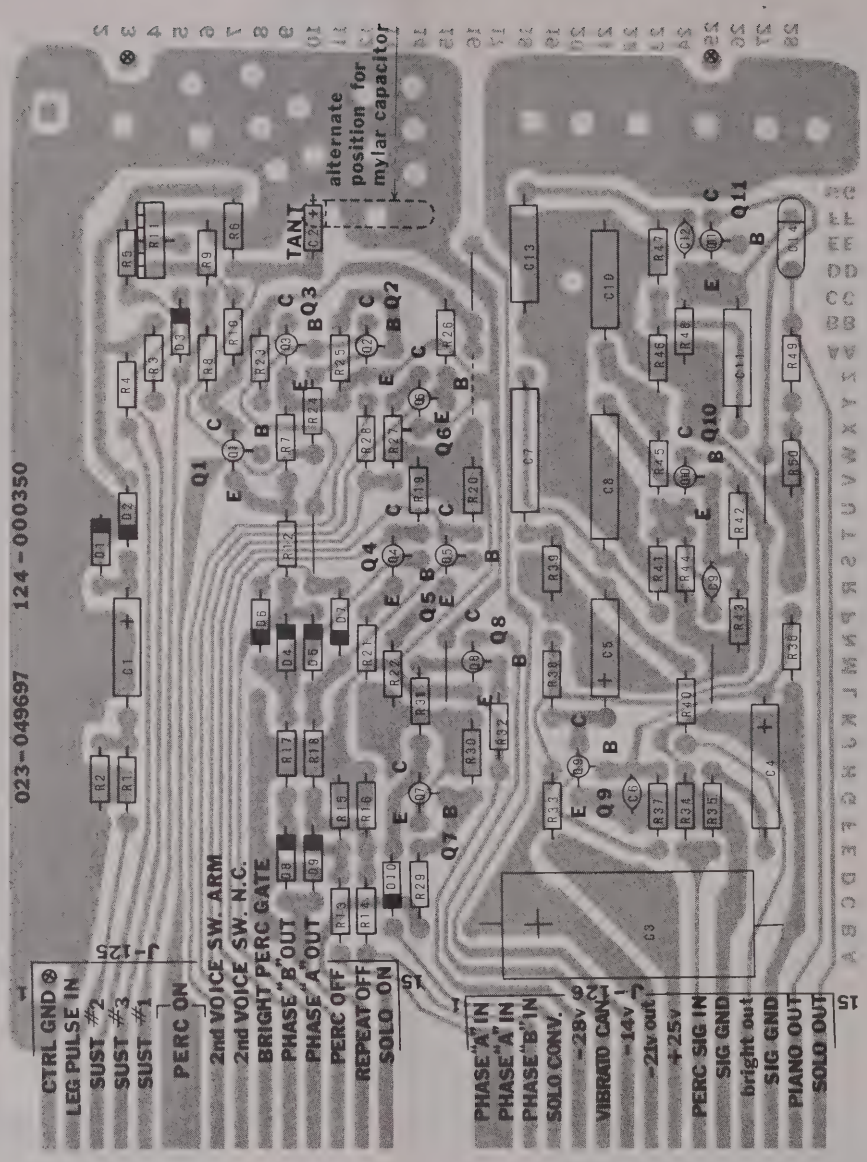


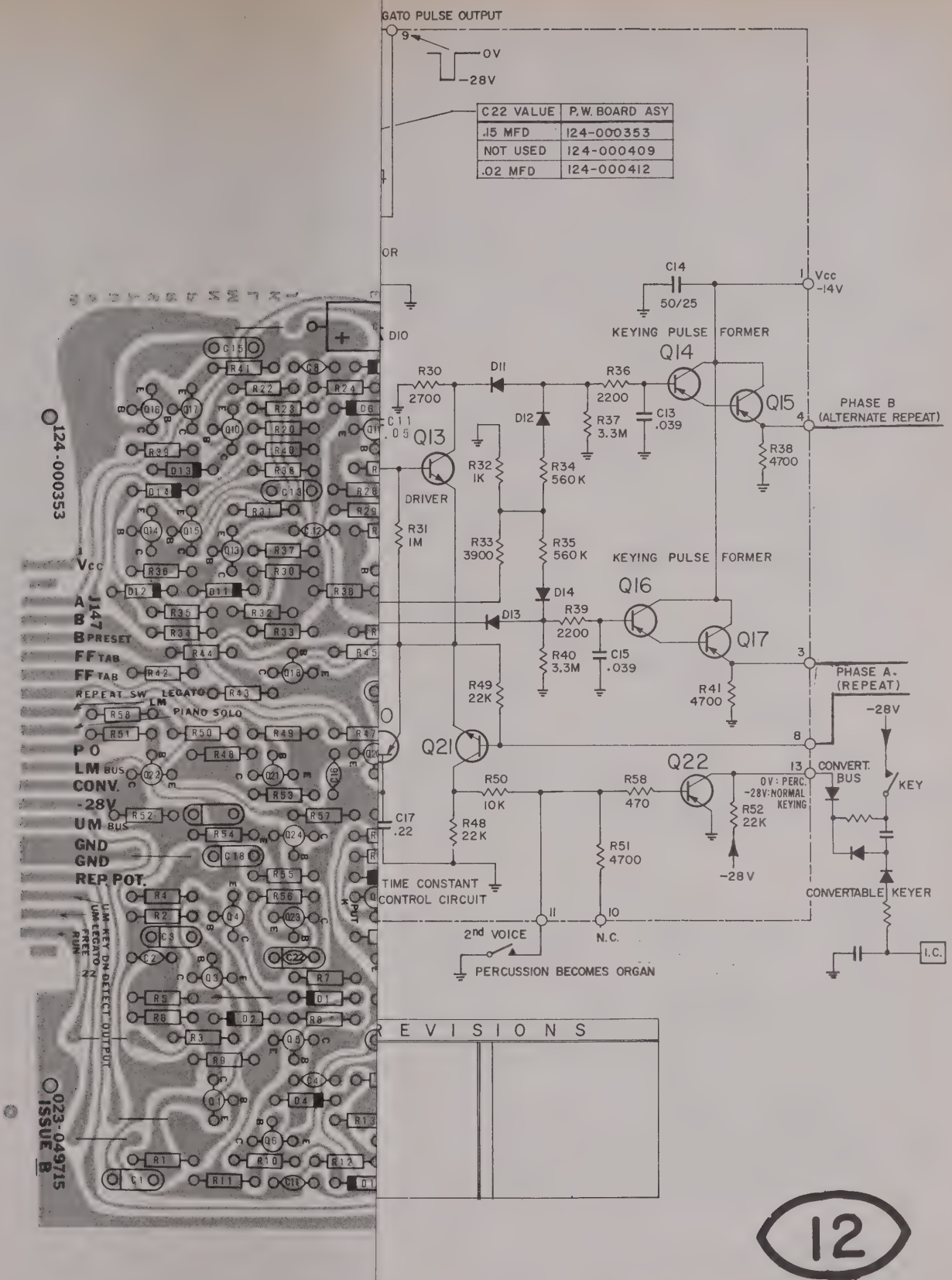
NOTE: FOR 124-000204 THEORY OF OPERATION SEE FIG. 3-12

10

FIGURE 3-14
SINE FILTER #3
SCHEMATIC, LAYOUT
AND THEORY
(124-000204)

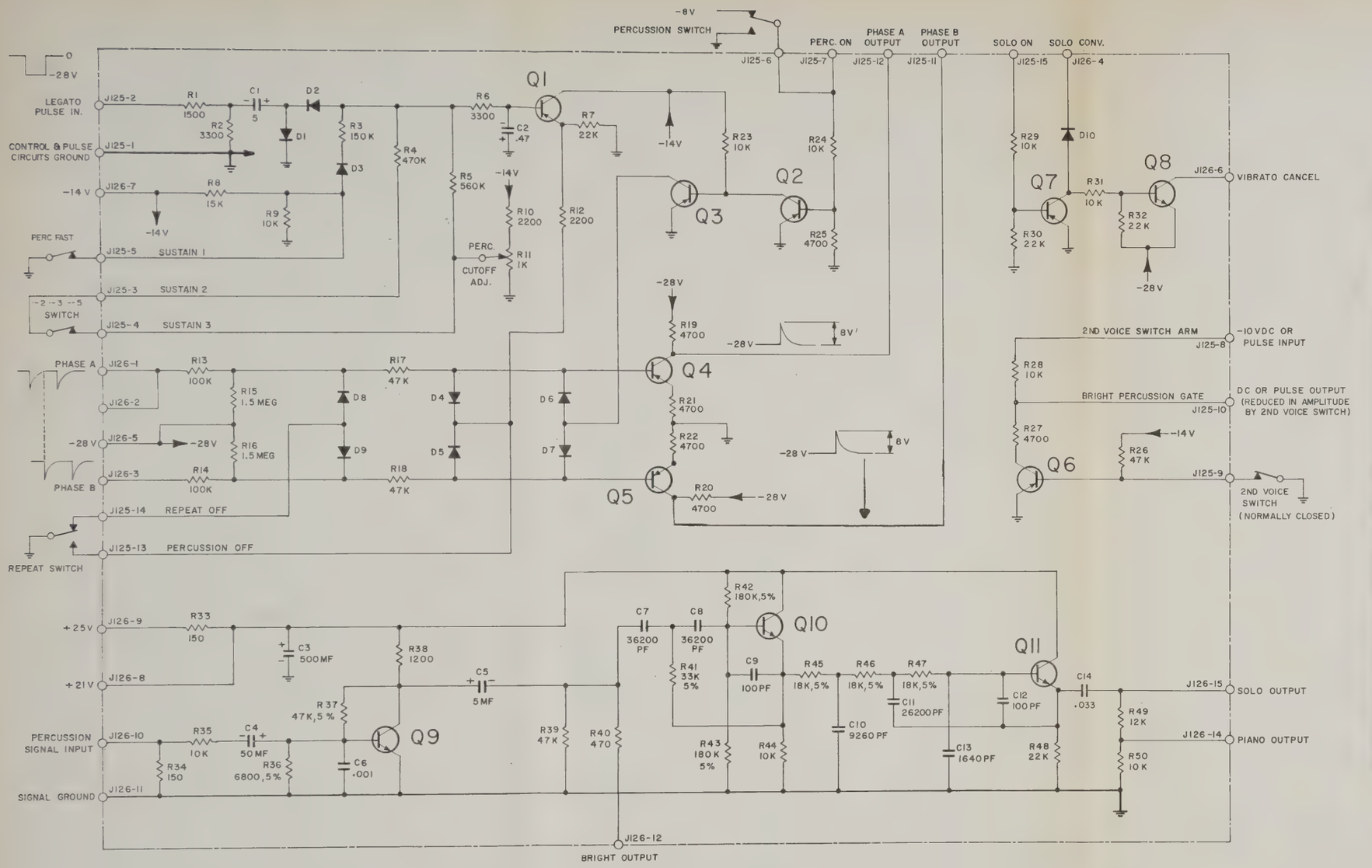

ONV.
6-4
Q8
J126-6
VIBRATO CANCEL
R31
10 K
R32
22 K
-28 V
ND VOICE SWITCH ARM
J125-8
-10 VDC OR
PULSE INPUT
RIGHT PERCUSSION GATE
J125-10
DC OR PULSE OUTPUT
(REDUCED IN AMPLITUDE
BY 2ND VOICE SWITCH)
-14 V
R26
47 K
J125-9
2ND VOICE
SWITCH
(NORMALLY CLOSED)
J126-15
SOLO OUTPUT
R49
12K
J126-14
PIANO OUTPUT
R50
10 K

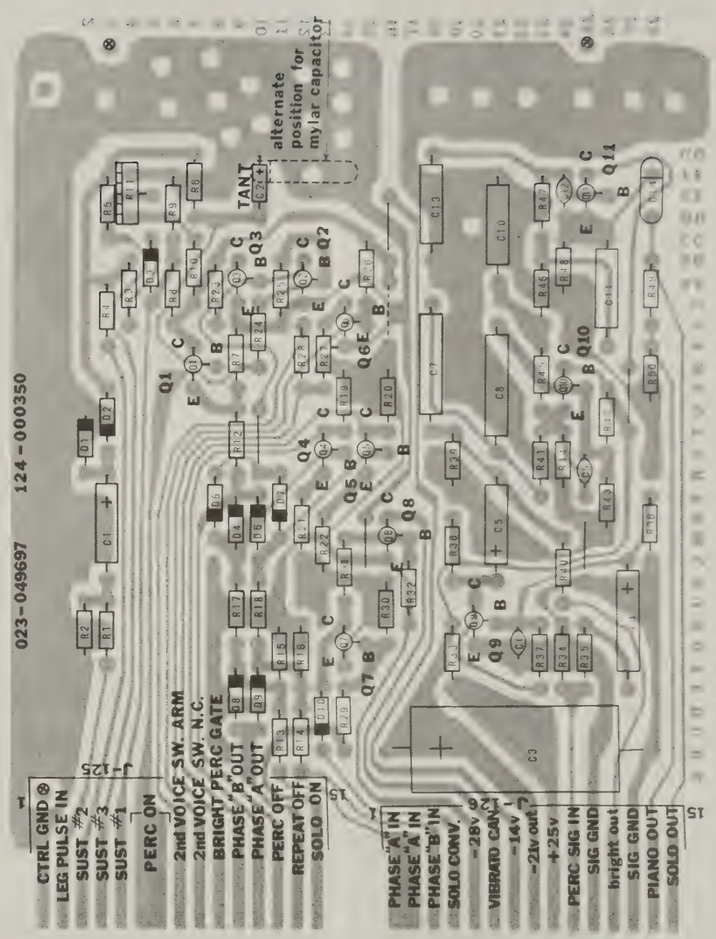

023-049697
124-000350
alternate
position for
mylar capacitor
TANT
CTRL GND
LEG PULSE IN
SUST #2
SUST #3
SUST #1
PERC ON
2nd VOICE SW. ARM
2nd VOICE SW. N.C.
BRIGHT PERC GATE
PHASE "B" OUT
PHASE "A" OUT
PERC OFF
REPEAT OFF
SOLO ON
PHASE "A" IN
PHASE "A" IN
PHASE "B" IN
SOLO CONV.
-28v
VIBRATO CAN
-14v
-12v out
+25v
PERC SIG IN
SIG GND
bright out
SIG GND
PIANO OUT
SOLO OUT



12

FIGURE 3-16
REPEAT OSCILLATOR & DETECTOR BOARD
SCHEMATIC, AND LAYOUT
(124-000353)





NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL ○— INDICATES PIN IN EDGE CONNECTOR. TWO EDGE CONNECTORS (J125 & J126) PIN NOS. SHOWN.
3. ALL SWITCHES ARE IN "OFF" POSITION, UNLESS OTHERWISE SHOWN.

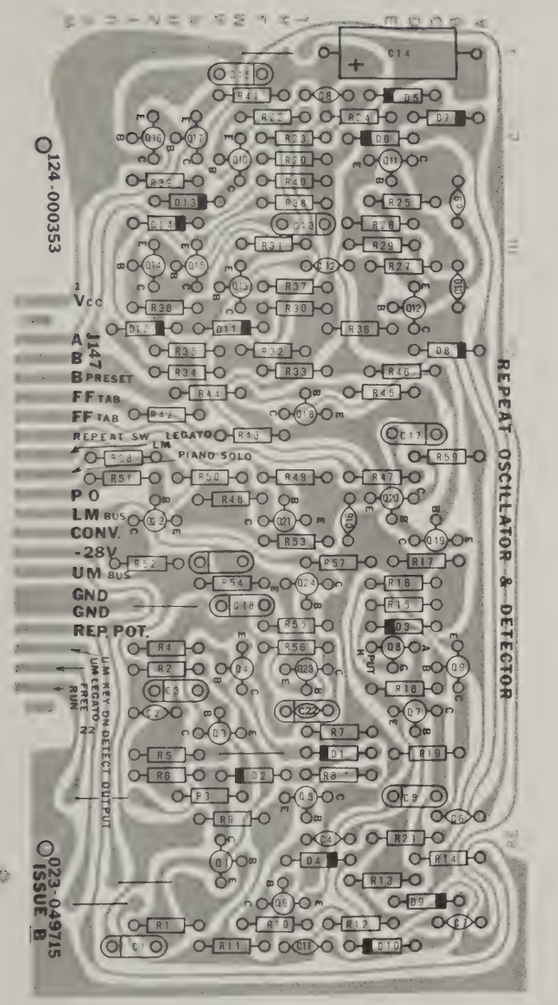
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
7	Q1 THRU Q7	001-021172	2N 4249
1	Q8	001-021133	2N 3394
3	Q9, Q10, Q11	001-021260	2N 5826
10	D1 THRU D10	001-026080	IN 4148

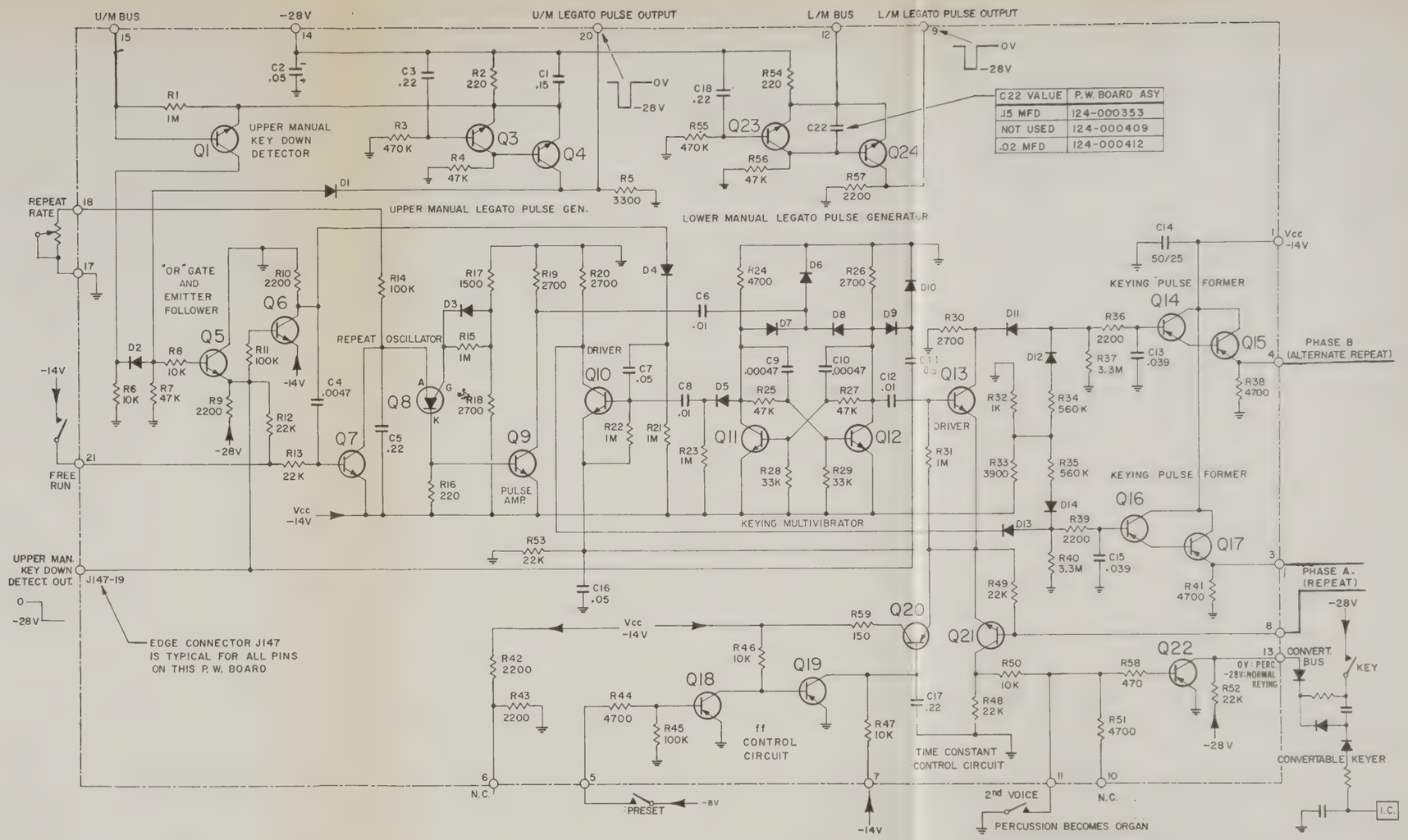
UPPER MANUAL SYNTHESIS PERCUSSION
124-000350
094-04970I-A

REVISIONS	

FIGURE 3-15
UPPER MANUAL SYNTHESIS
PERCUSSION BOARD
SCHEMATIC AND LAYOUT
(124-000350)

11





NOTES:

1. SEE C22 VALUE CHART FOR P.W. BOARD ASY NO.
2. UNLESS OTHERWISE SPECIFIED: ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%; ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. UNLESS OTHERWISE SHOWN, ALL SWITCHES ARE IN OFF POSITION.
4. SYMBOL ○7 INDICATES PIN NO. OF CONNECTOR J147.

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
14	Q1,Q3,Q4 THRU Q7,Q9 THRU Q13,Q21,Q23,Q24	001-021134	2N 3394
1	Q8 (PUT)	001-026050	2N 6027
8	Q14 THRU Q20 & Q22	001-021172	2N 4249
14	D1 THRU D14	001-026080	IN 4148

REPEAT OSCILLATOR AND DETECTOR
124-000353

094-049719-A

REVISIONS

12

FIGURE 3-16
REPEAT OSCILLATOR & DETECTOR BOARD SCHEMATIC, AND LAYOUT
(124-000353)

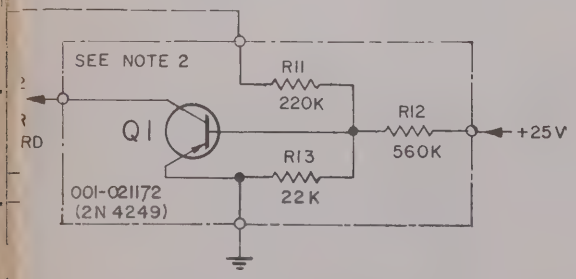
REVISIONS

AS .082. C15 WAS 18,500 pf. C18 WAS .22. R15
OOK. C10 WAS 1/35 V.
R10 WERE 100 Ω. R35 WAS 15 K.
.01MFD, DELETED.
S 1/35 V. C5, .0047, DELETED. C9 WAS .47 RADIAL.
AS 4.7/10 V. C13 WAS .0047 CERAMIC. C14, .01,
ED. C18 WAS .33 RADIAL. C33, .01, DELETED.
AS 10 K. R15 WAS 120 K. R17 WAS 100 K. R47 &
DDED. 8' MUTE (& PIN 3) DELETED. 16' MUTE
N 8) DELETED. PART NO. ADDED TO Q9. ADDED
GROUND PINS. UNUSED TERMINAL 9 SHOWN.
AS 10 K. R6 WAS 150 K. R45 WAS 15 K. C4 WAS
MFD. CERAMIC.
D PEDAL DRAWBARS & PEDAL SNUBBER CIRCUITS.

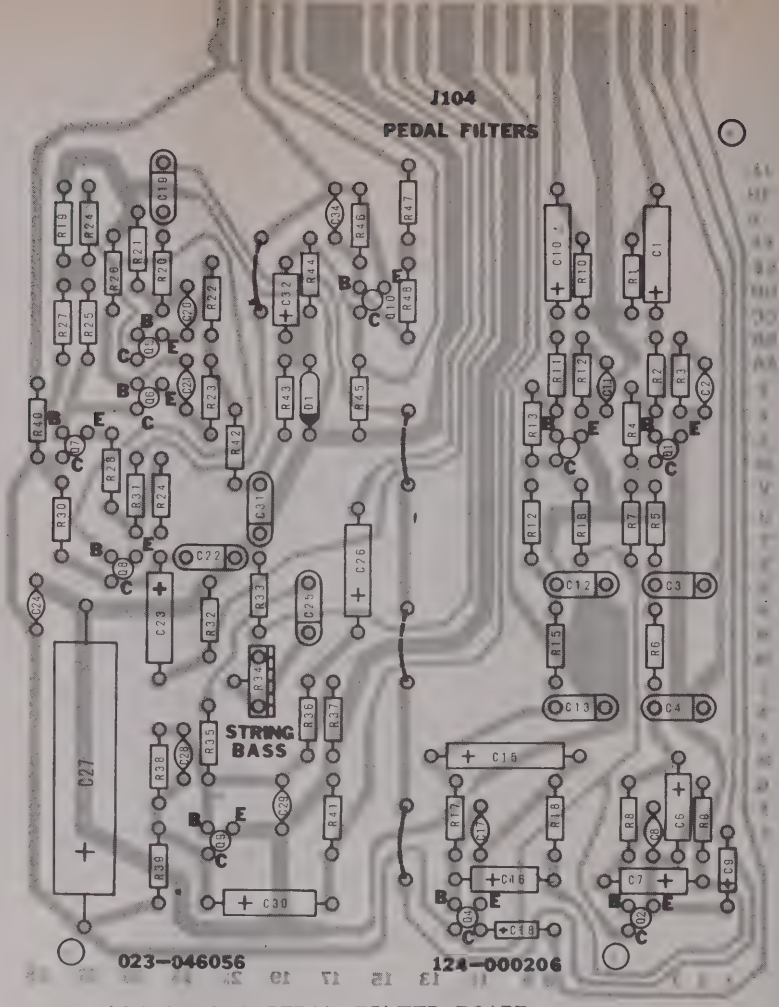
S:

OTHERWISE NOT SPECIFIED:
RESISTOR VALUES ARE IN OHMS,
1/2 WATT, ± 10 %;
CAPACITOR VALUES ARE IN MICROFARADS.

EDAL SNUBBER CIRCUIT:
A) NOT USED IN EARLY MODELS.
B) INSTALLED IN LATER MODELS, AS SHOWN.
C) TRANSFERED TO 124-000360 P.W. BOARD
IN PRESENT MODELS.



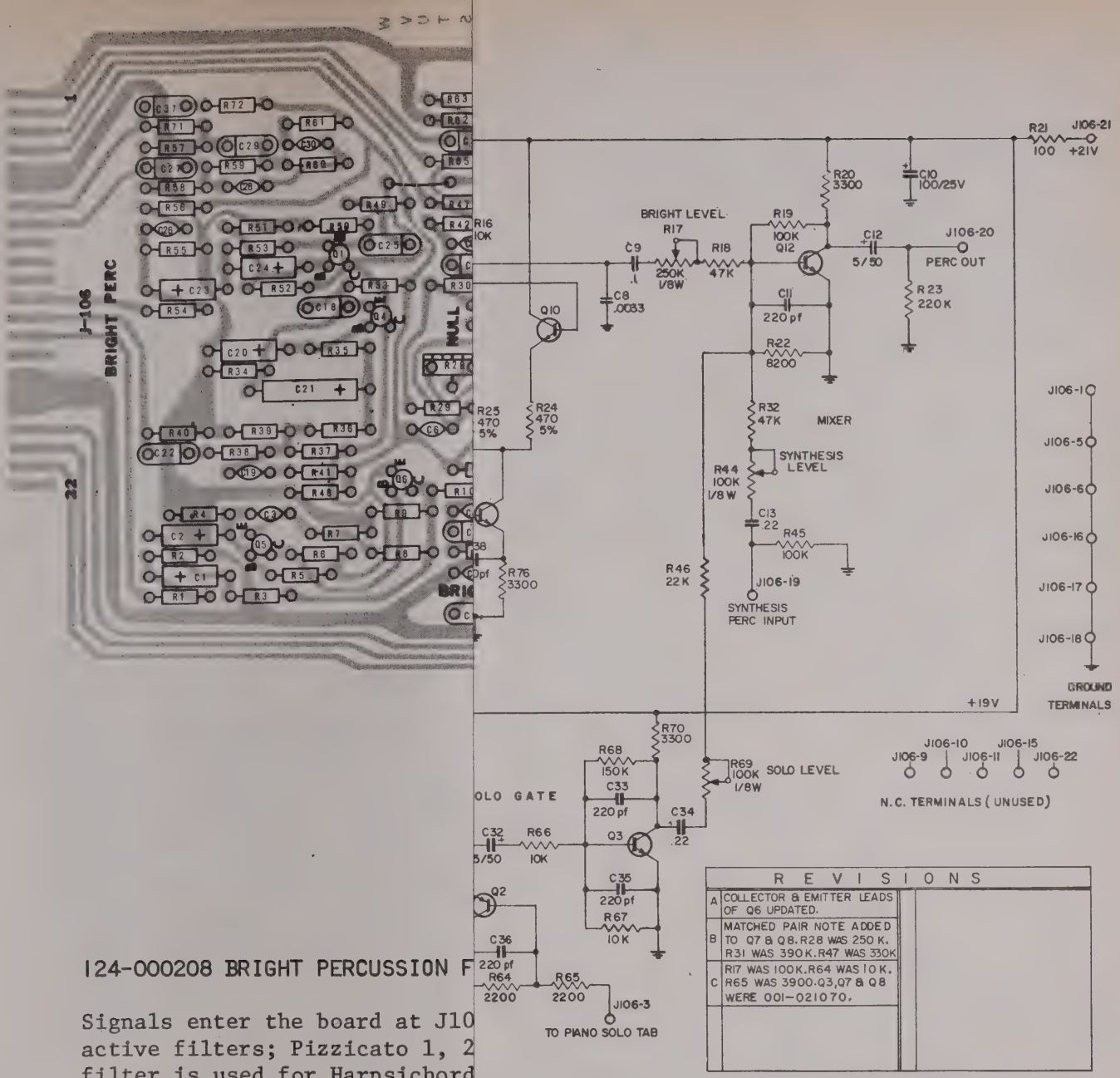
PEDAL SNUBBER TERMINAL STRIP
063-048130



124-000206 PEDAL FILTER BOARD

Pedal output signals (Square-Wave) from J111 and J112 on the Lower Manual Synthesis Mother Board, (124-000223) enter the 16' and 8' active low pass filter circuits at J104, pins 7 and 4, of the Pedal Filter Board where sine-wave pedal tones are produced. 8' String Bass gating and a pedal down detector are also provided. The String Bass gate is a two stage differential amplifier, (Q5-Q6 and Q7-Q8) which operates in a touch response percussion mode, but does not decay to inaudibility. Touch response keying information for the String Bass circuit and follow-the-player rhythm is provided by the pedal down detector, which connects to the pedal keying bus. R47 and R48 prevent Q10 in pedal down detector from failing when pedal keying bus is shorted to ground. Pedal tones go to associated terminal strip and to either J141, pins 1 and 9 on the auto-accompaniment board (124-000444) or to pedal tonebars thru external 12K resistors, then back to Q9 on pedal filter board for amplification and mixing with String Bass.

CAUTION NOTE: Early models of the 124-000206 board do not have protective resistors, therefore pedal keying bus must not be shorted to ground.



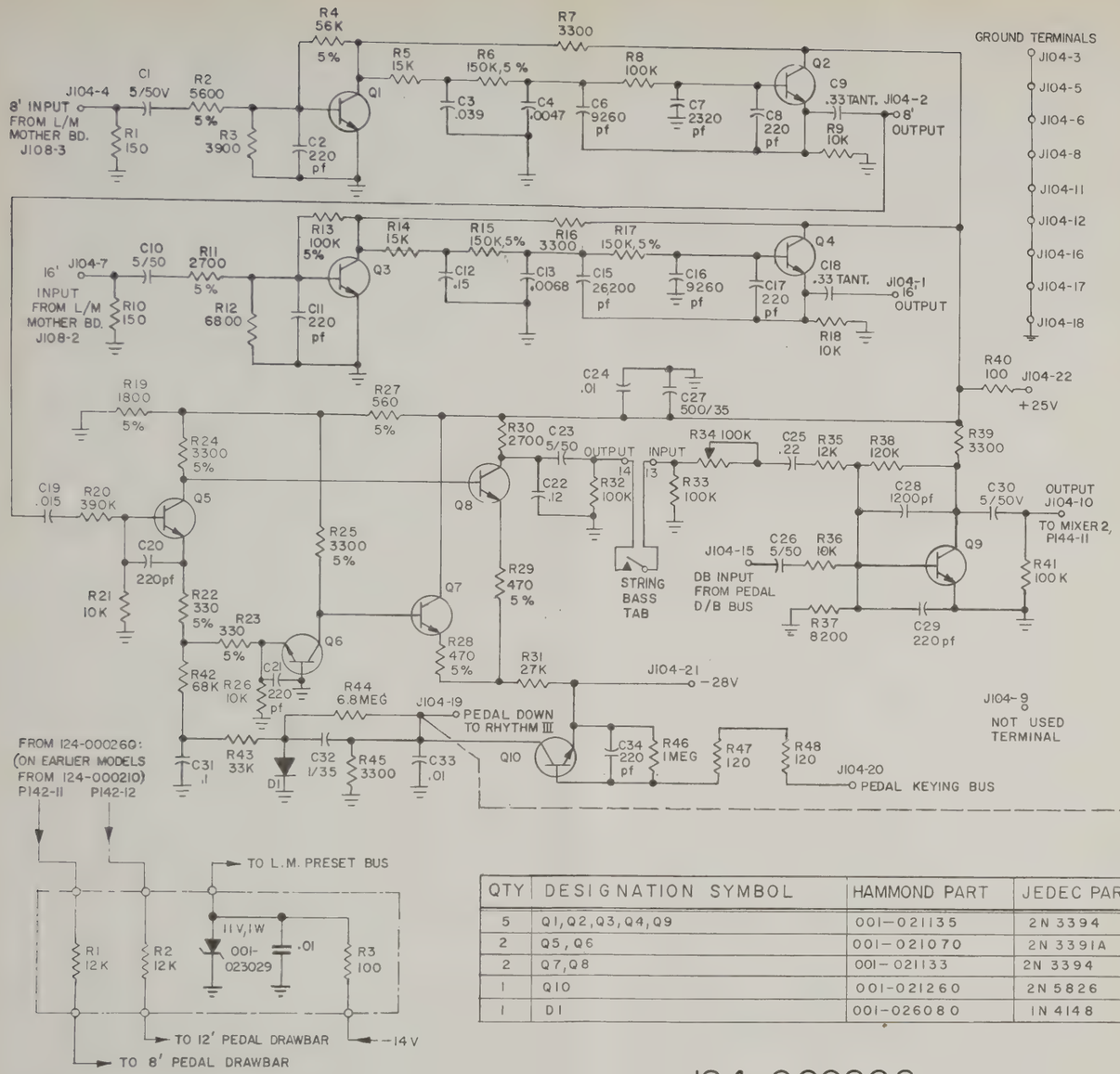
REVISIONS		
A	COLLECTOR & EMITTER LEADS OF Q6 UPDATED.	
B	MATCHED PAIR NOTE ADDED TO Q7 & Q8. R28 WAS 250 K. R31 WAS 390 K. R47 WAS 330K	
C	R17 WAS 100K. R64 WAS 10 K. R65 WAS 3900. Q3, Q7 & Q8 WERE 001-021070.	

124-000208 BRIGHT PERCUSSION F

Signals enter the board at J10
active filters; Pizzicato 1, 2
filter is used for Harpsichord
are mixed with a Piano voice i
000350 board into the repeat g
Q8, Q9 and Q10, a two stage di
that has the emitter current o
(Q7-Q8) supplied by a sawtooth
J147 on the Repeat Oscillator
(124-000353) when repeat is on
when repeat is off. There is
(R28) to minimize repeat thump
ed pair of transistors (001-02
first stage to achieve the bes
changes the level of D.C. or s
the repeat gate, providing For
When Piano Solo is used, repea
trol voltage are removed, turn
Percussion. On/Off gating at
cation at Q3 are provided for
input at pin 2 bypasses the re
thesis percussion signals ente
pin 19 and are summed with rep
cussion and Piano Solo at outp

14

FIGURE 3-18
BRIGHT PERCUSSION FILTER BOARD
SCHEMATIC, LAYOUT
(124-000208)



PEDAL DRAWBARS TERMINAL STRIP
063-046759

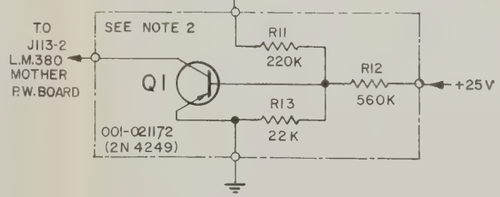
QTY	DESIGNATION SYMBOL	HAMMOND PART	JEDEC PART
5	Q1,Q2,Q3,Q4,Q9	001-021135	2N 3394
2	Q5,Q6	001-021070	2N 3391A
2	Q7,Q8	001-021133	2N 3394
1	Q10	001-021260	2N 5826
1	D1	001-026080	IN 4148

124-000206
094-046068-D

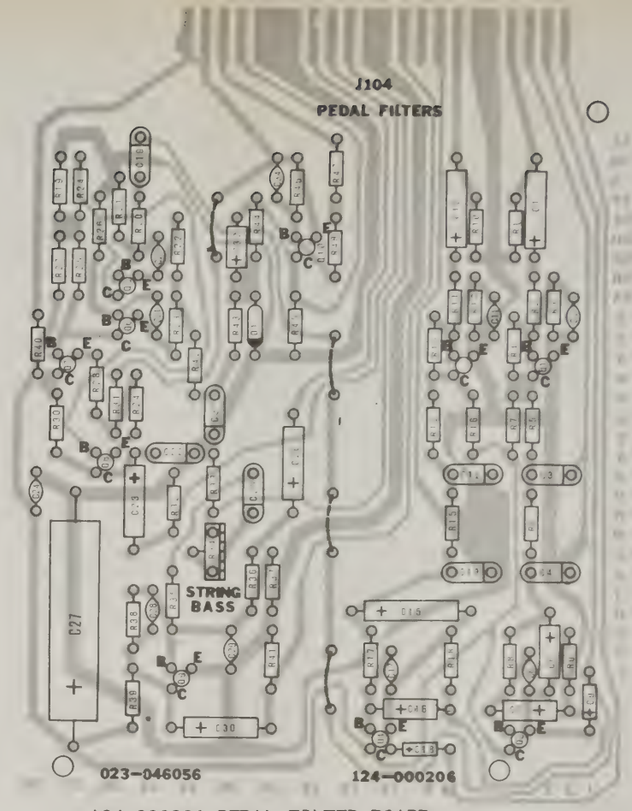
REVISIONS	
A	C12 WAS .082. C15 WAS 18,500 pf. C18 WAS .22. R15 WAS 100K. C10 WAS 1/35 V.
B	R1 & R10 WERE 100Ω. R35 WAS 15 K.
C	C33, .01MFD, DELETED.
D	C1 WAS 1/35 V. C5, .0047, DELETED. C9 WAS .47 RADIAL. C10 WAS 4.7/10 V. C13 WAS .0047 CERAMIC. C14, .01, DELETED. C18 WAS .33 RADIAL. C33, .01, DELETED. R14 WAS 10 K. R15 WAS 120 K. R17 WAS 100 K. R47 & R48 ADDED. 8' MUTE (& PIN 3) DELETED. 16' MUTE (& PIN 8) DELETED. PART NO. ADDED TO Q9. ADDED 3 & 8 GROUND PINS. UNUSED TERMINAL 9 SHOWN. R5 WAS 10 K. R6 WAS 150 K. R45 WAS 15 K. C4 WAS .0022 MFD. CERAMIC.
OS	ADDED PEDAL DRAWBARS & PEDAL SNUBBER CIRCUITS.

NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ± 10 % ;
   CAPACITOR VALUES ARE IN MICROFARADS.
2. PEDAL SNUBBER CIRCUIT:
   A) NOT USED IN EARLY MODELS.
   B) INSTALLED IN LATER MODELS, AS SHOWN.
   C) TRANSFERED TO 124-000360 P.W. BOARD IN PRESENT MODELS.



PEDAL SNUBBER TERMINAL STRIP
063-048130



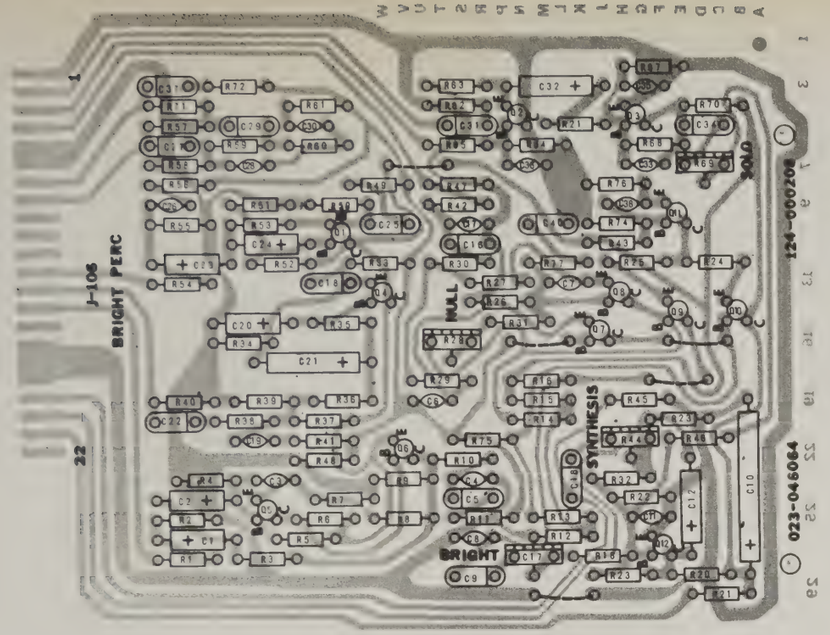
124-000206 PEDAL FILTER BOARD

Pedal output signals (Square-Wave) from J111 and J112 on the Lower Manual Synthesis Mother Board, (124-000223) enter the 16' and 8' active low pass filter circuits at J104, pins 7 and 4, of the Pedal Filter Board where sine-wave pedal tones are produced. 8' String Bass gating and a pedal down detector are also provided. The String Bass gate is a two stage differential amplifier, (Q5-Q6 and Q7-Q8) which operates in a touch response percussion mode, but does not decay to inaudibility. Touch response keying information for the String Bass circuit and follow-the-player rhythm is provided by the pedal down detector, which connects to the pedal keying bus. R47 and R48 prevent Q10 in pedal down detector from failing when pedal keying bus is shorted to ground. Pedal tones go to associated terminal strip and to either J141, pins 1 and 9 on the auto-accompaniment board (124-000444) or to pedal tonebars thru external 12K resistors, then back to Q9 on pedal filter board for amplification and mixing with String Bass.

CAUTION NOTE: Early models of the 124-000206 board do not have protective resistors, therefore pedal keying bus must not be shorted to ground.

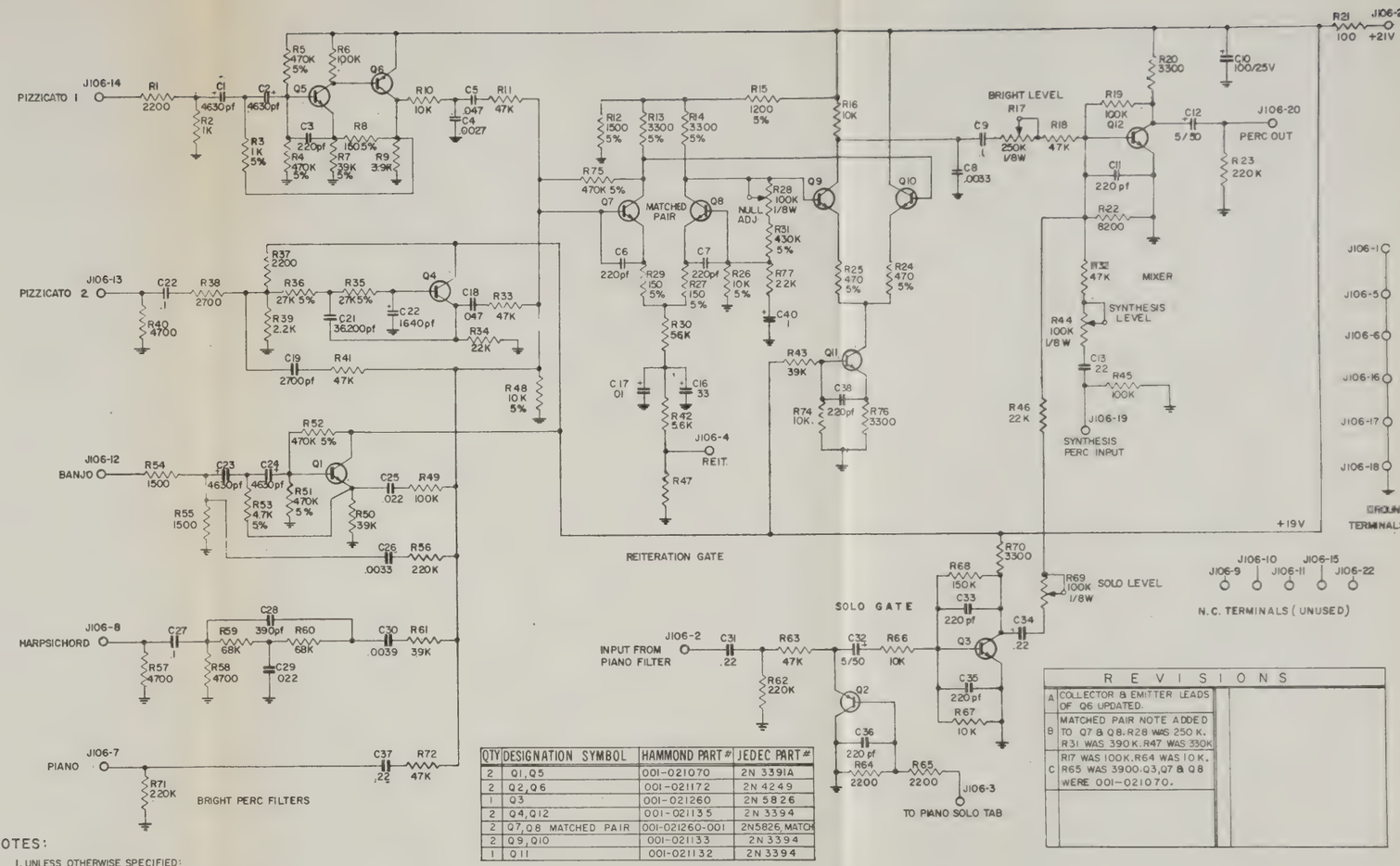
13

FIGURE 3-17
PEDAL FILTER BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000206)



124-000208 BRIGHT PERCUSSION FILTER BOARD

Signals enter the board at J106 and pass thru three active filters; Pizzicato 1, 2 and Banjo, a passive filter is used for Harpsichord. The filter outputs are mixed with a Piano voice input from the 124-000350 board into the repeat gate composed of Q7, Q8, Q9 and Q10, a two stage differential amplifier that has the emitter current of its first stage (Q7-Q8) supplied by a sawtooth repeat signal from J147 on the Repeat Oscillator and Detector board (124-000353) when repeat is on, or a D.C. level when repeat is off. There is a null adjustment (R28) to minimize repeat thump, requiring a matched pair of transistors (001-021260-001) in the first stage to achieve the best null. Tab action changes the level of D.C. or sawtooth signal to the repeat gate, providing Fortissimo as desired. When Piano Solo is used, repeat signal and control voltage are removed, turning off Bright Percussion. On/Off gating at Q2 and amplification at Q3 are provided for Piano Solo whose input at pin 2 bypasses the repeat gate. Synthesis percussion signals enter this board at pin 19 and are summed with repeated bright percussion and Piano Solo at output amplifier, Q12.



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   CAPACITOR VALUES ARE IN MICROFARADS,
   WITH VOLTAGES SHOWN FOR ELECTROLYTICS ONLY.
   CAPACITOR TOLERANCE - MYLAR & CERAMIC: ±10%, POLYSTYRENE: ±2.5%.

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
2	Q1, Q5	001-021070	2N 3391A
2	Q2, Q6	001-021172	2N 4249
1	Q3	001-021260	2N 5826
2	Q4, Q12	001-021135	2N 3394
2	Q7, Q8 MATCHED PAIR	001-021260-001	2N5826, MATCH
2	Q9, Q10	001-021133	2N 3394
1	Q11	001-021132	2N 3394

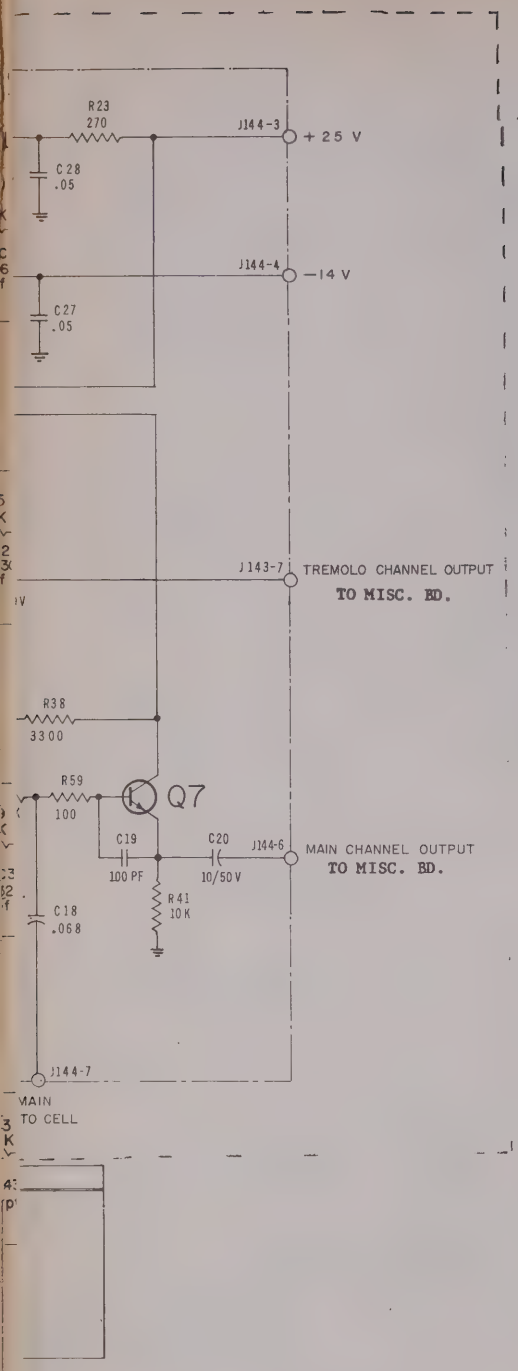
REVISIONS		
A	COLLECTOR & EMITTER LEADS OF Q6 UPDATED.	
B	MATCHED PAIR NOTE ADDED TO Q7 & Q8. R28 WAS 250 K. R31 WAS 390 K. R47 WAS 330K	
C	R17 WAS 100K. R64 WAS 10 K. R65 WAS 3900. Q3, Q7 & Q8 WERE 001-021070.	

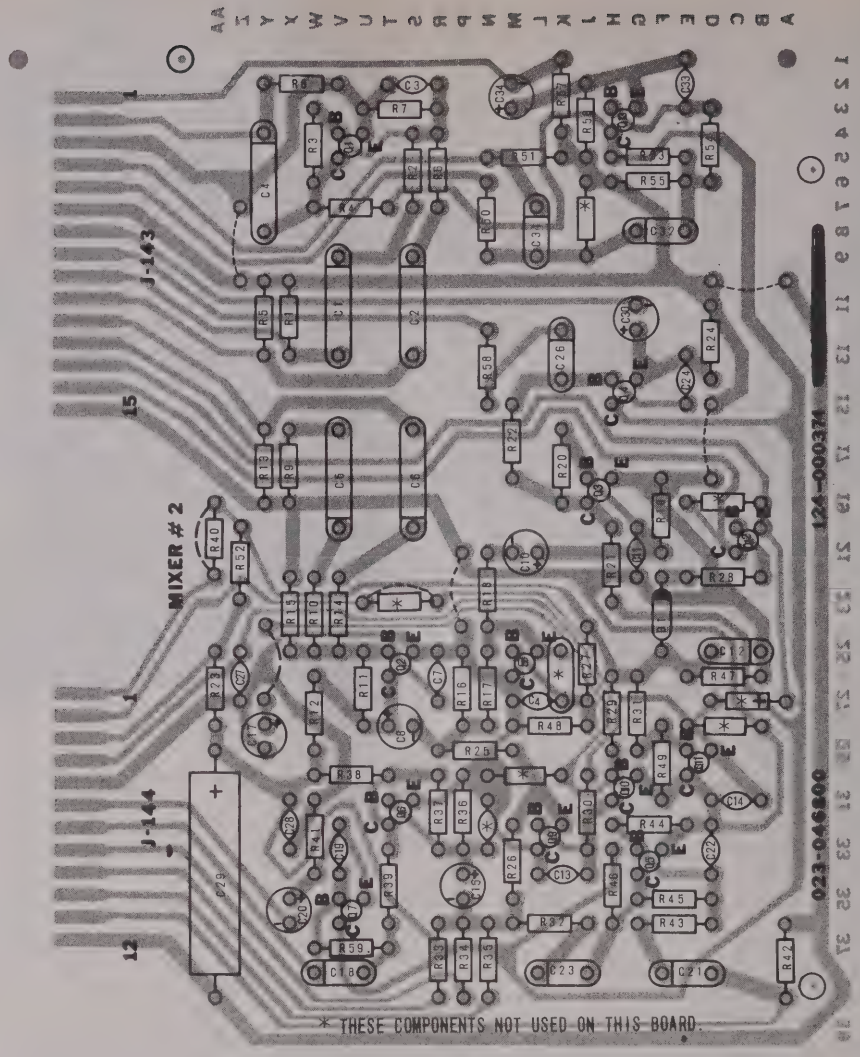
124-000208
094-046070-C

Gain controls are provided for these signals at R69 (Solo), R44 (Synthesis), and R17 (Bright). The required +21V comes from the Piano Filter Board (124-000350) which has a decoupling filter for the supply.

14

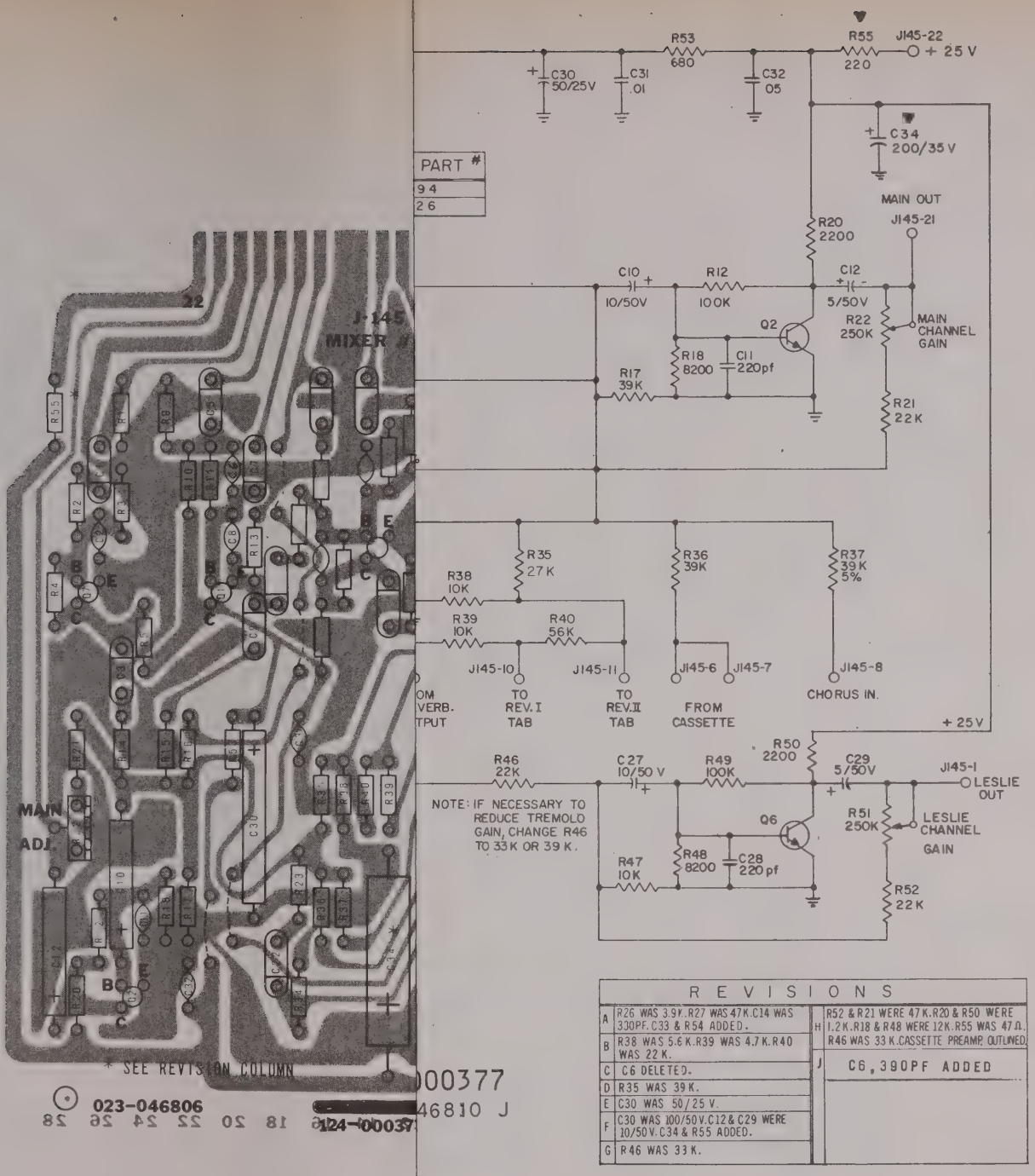
FIGURE 3-18
BRIGHT PERCUSSION FILTER BOARD
SCHEMATIC, LAYOUT
(124-000208)





ction cancel cir-
n and tremolo
nual signals
and mixing of
m low fre-
in channel. A
upper manual.
l is removed
response to
ontrol con-
olls off 3 DB/
built-in 2
l brilliance
l (124-000444)
circuitry is

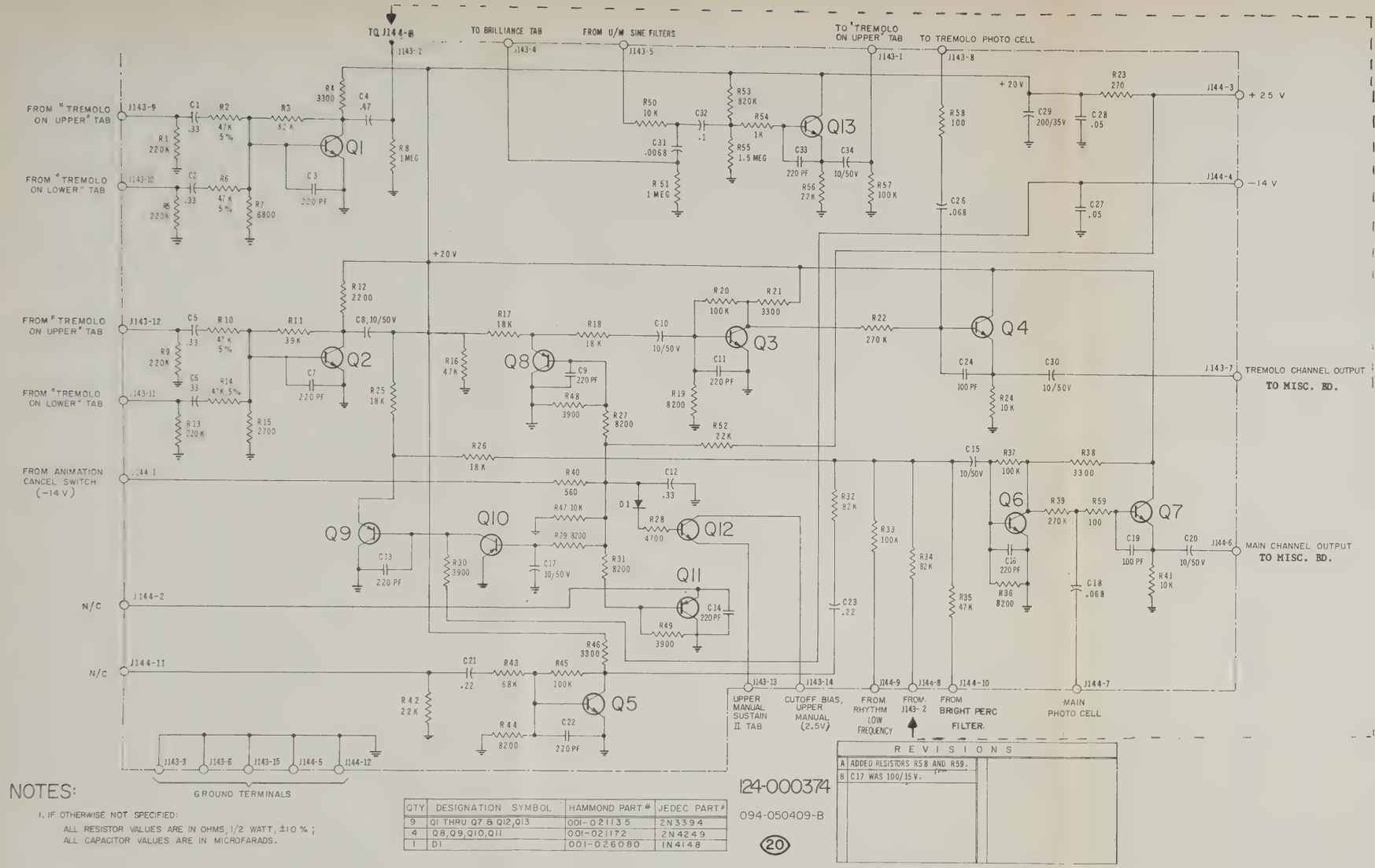
an electronic single pole, double throw switch with "pop" suppression, activated by -28V applied thru the expression pedal left side switch. Closing the switch removes all signals in the tremolo channel and routes them to the main channel. In parallel with the "Sustain to Foot Switch" tab, an electronic switch opens the upper manual 380 time constant circuit, converting the keyers to long sustain mode. Another switch grounds the After Vibrato On/Off control line, removing vibrato.



PART #
94
26

REVISIONS			
A	R26 WAS 3.9K. R27 WAS 47K. C14 WAS 330PF. C33 & R54 ADDED.	H	R52 & R21 WERE 47K. R20 & R50 WERE 1.2K. R18 & R48 WERE 12K. R55 WAS 47Ω. R46 WAS 33K. CASSETTE PREAMP. OUTLINED.
B	R38 WAS 5.6K. R39 WAS 4.7K. R40 WAS 22K.	J	C6, 390PF ADDED
C	C6 DELETED.		
D	R35 WAS 39K.		
E	C30 WAS 50/25 V.		
F	C30 WAS 100/50 V. C12 & C29 WERE 10/50 V. C34 & R55 ADDED.		
G	R46 WAS 33K.		

FIGURE 3-20
MIXER BOARD #3
SCHEMATIC, LAYOUT AND THEORY
(124-000377)



NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10 %;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.

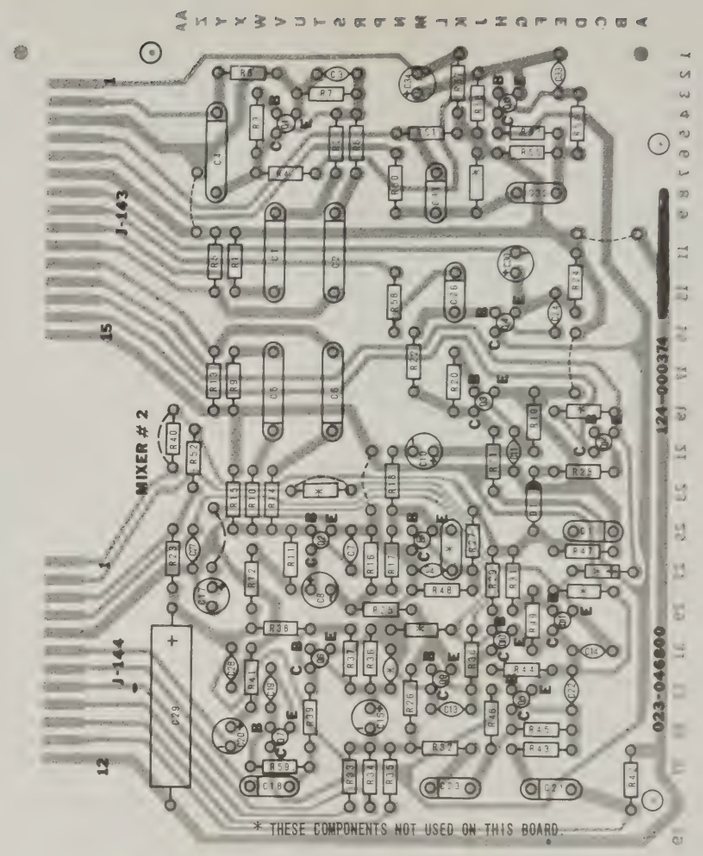
QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
9	Q1 THRU Q7 & Q12,Q13	001-021135	2N3394
4	Q8,Q9,Q10,Q11	001-021172	2N4249
1	D1	001-026080	IN4148

124-000374

094-050409-B

20

REVISIONS	
A	ADDED RESISTORS R58 AND R59.
B	C17 WAS 100/15V.

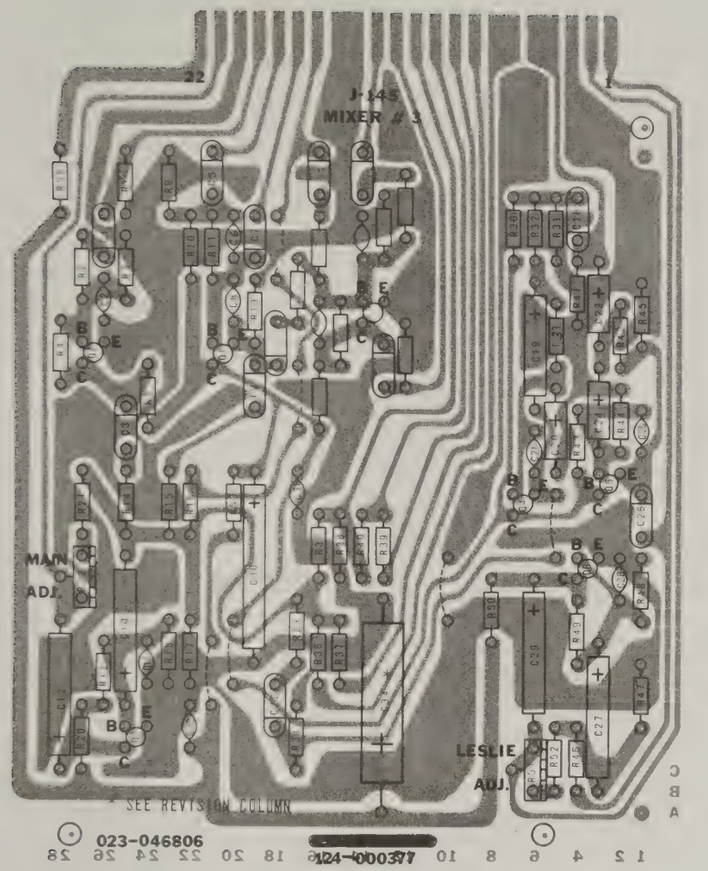


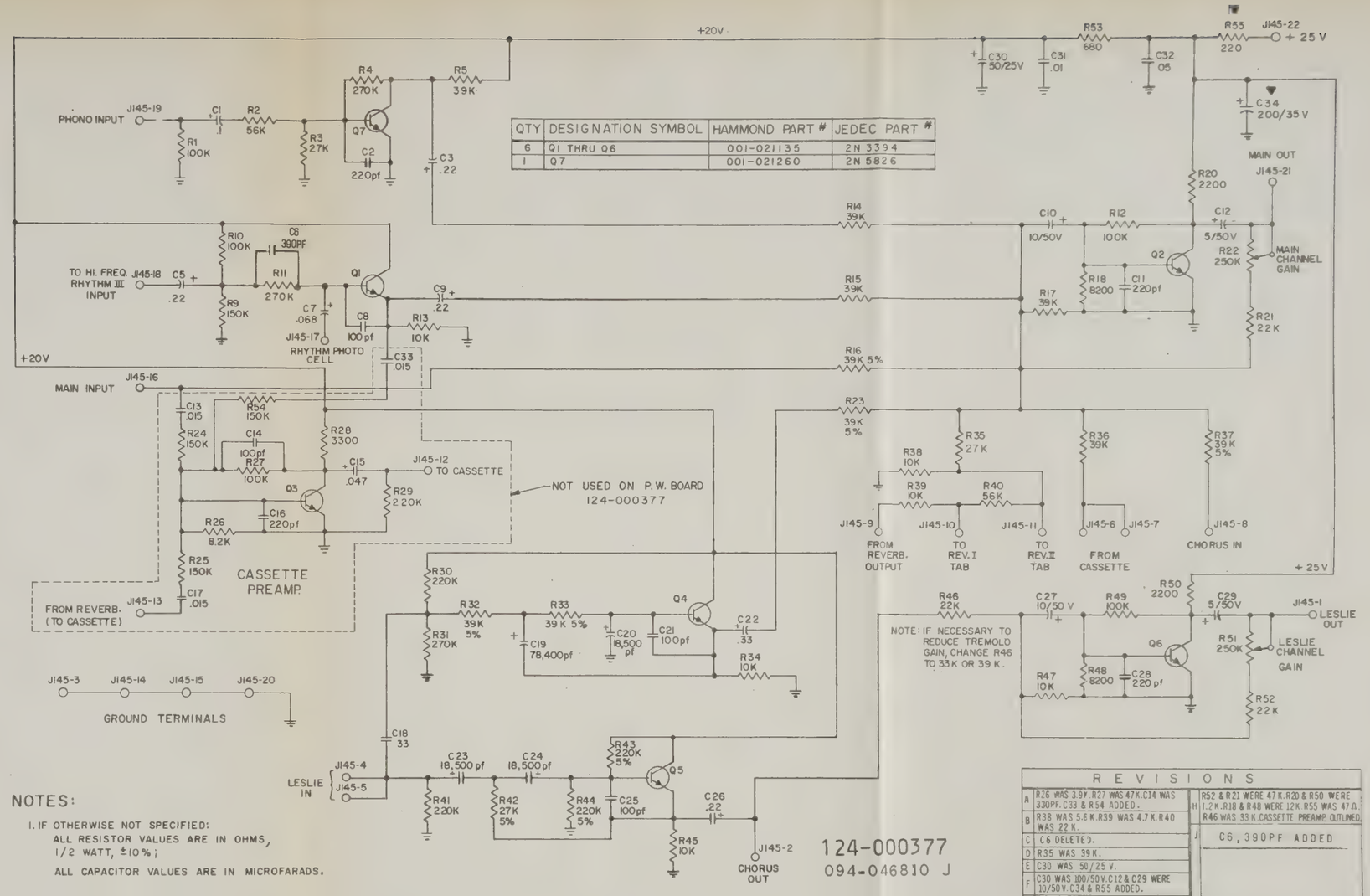
15

FIGURE 3-19
MIXER BOARD #2
SCHEMATIC, LAYOUT AND THEORY
(124-000374)

124-000374 MIXER #2 BOARD

This assembly is used to provide animation cancel circuitry, swell pedal contouring for main and tremolo channels, mixing of upper and lower manual signals into After Vibrato or Acoustic Tremolo and mixing of After Vibrato output, percussion, rhythm low frequencies and pedal signals into the main channel. A brilliance control is included for the upper manual. When brilliance control is on, a ground is removed from the circuit allowing upper manual response to be flat. Turning off the brilliance control connects circuit to ground and response rolls off 3 DB/ octave from 2000 HZ. The control has a built-in 2 DB loss, which enables the lower manual brilliance control on the Auto-Accompaniment Board (124-000444) to be effective. The animation cancel circuitry is an electronic single pole, double throw switch with "pop" suppression, activated by -28V applied thru the expression pedal left side switch. Closing the switch removes all signals in the tremolo channel and routes them to the main channel. In parallel with the "Sustain to Foot Switch" tab, an electronic switch opens the upper manual 380 time constant circuit, converting the keyers to long sustain mode. Another switch grounds the After Vibrato On/Off control line, removing vibrato.




+20V
PHONO INPUT J145-19
TO HI. FREQ. RHYTHM III INPUT J145-18
RHYTHM PHOTO CELL J145-17
MAIN INPUT J145-16
FROM REVERB. (TO CASSETTE) J145-13
CASSETTE PREAMP.
J145-12 TO CASSETTE
NOT USED ON P.W. BOARD 124-000377
GROUND TERMINALS J145-3 J145-14 J145-15 J145-20
LESLIE IN J145-4 J145-5
CHORUS OUT J145-2
J145-22 + 25 V
MAIN OUT J145-21
MAIN CHANNEL GAIN
LESLIE CHANNEL GAIN
J145-1 LESLIE OUT
J145-9 FROM REVERB. OUTPUT
J145-10 TO REV. I TAB
J145-11 TO REV. II TAB
J145-6 J145-7 FROM CASSETTE
J145-8 CHORUS IN
NOTE: IF NECESSARY TO REDUCE TREMOLO GAIN, CHANGE R46 TO 33K OR 39K.

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
6	Q1 THRU Q6	001-021135	2N 3394
1	Q7	001-021260	2N 5826

NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.

REVISIONS			
A	R26 WAS 3.9K. R27 WAS 47K. C14 WAS 330PF. C33 & R54 ADDED.	H	R52 & R21 WERE 47K. R20 & R50 WERE 1.2K. R18 & R48 WERE 12K. R55 WAS 47Ω. R46 WAS 33K. CASSETTE PREAMP OUTLINED.
B	R38 WAS 5.6K. R39 WAS 4.7K. R40 WAS 22K.	J	C6, 390PF ADDED
C	C6 DELETED.		
D	R35 WAS 39K.		
E	C30 WAS 50/25 V.		
F	C30 WAS 100/50 V. C12 & C29 WERE 10/50 V. C34 & R55 ADDED.		
G	R46 WAS 33K.		

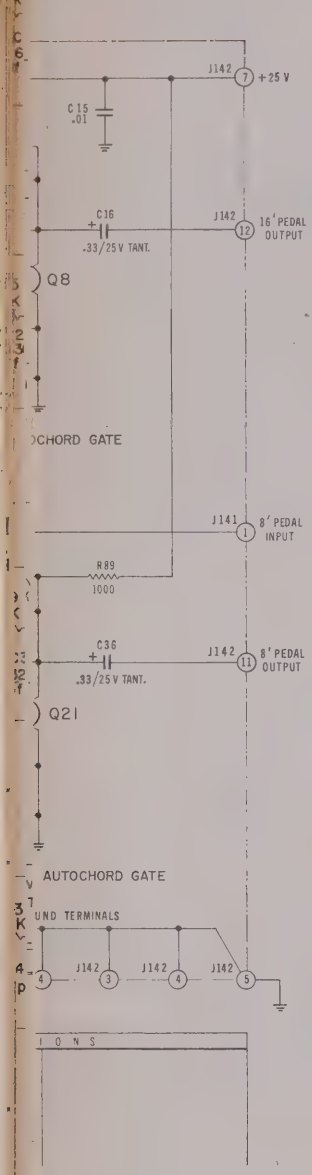
124-000377
094-046810 J

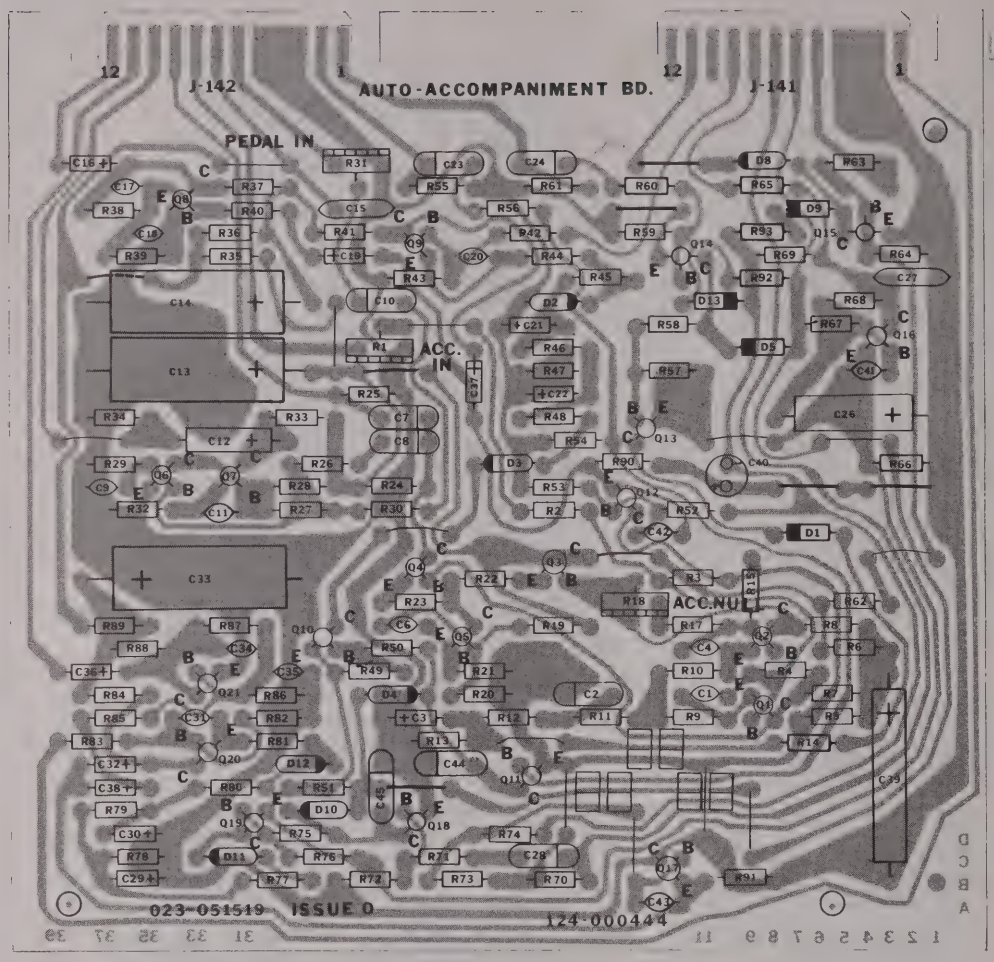
124-000377 MIXER BOARD #3

Mixer PWB #3 is used to provide final mixing before the power amplifier, phono preamplification, tremolo filter, and swell pedal contouring for rhythm white noise voices.

The final mixers for both Main and Tremolo channels have a low enough output impedance to drive a 5K ohm external lead in addition to the organ power amplifier so that they can be used to drive tone cabinets.

FIGURE 3-20
MIXER BOARD #3
SCHEMATIC, LAYOUT AND THEORY
(124-000377)





RD

4-000444 is used to provide
or the lower manual and pedals
m a Rhythm Unit. Mixing of
edal snubbing is also provided.

for the lower manual is simi-
in PWB 124-000208, except
me constant when triggered by
ating signal is approximately
when autochord is off, so that
nce in loudness. The pedal
p in the absence of signal is
g of the signal amplifiers.

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL---○--- INDICATES EDGE CONNECTOR PIN NUMBER.

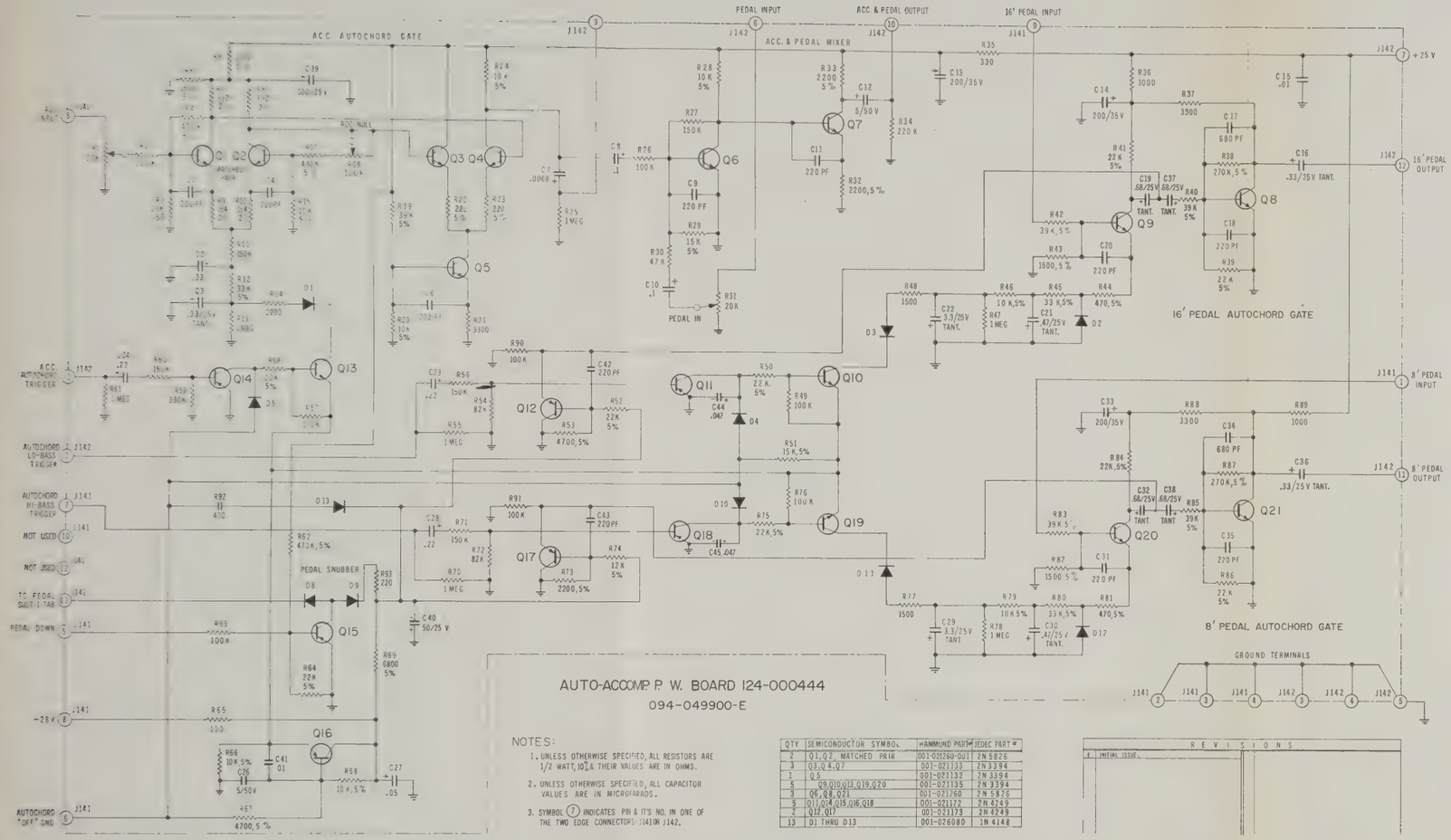
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
4	Q1,Q2,Q3 & Q6	001-021172	2N4249
2	Q4, Q5	001-021133	2N3394
1	Q7	001-021260	2N5826

REVISIONS		

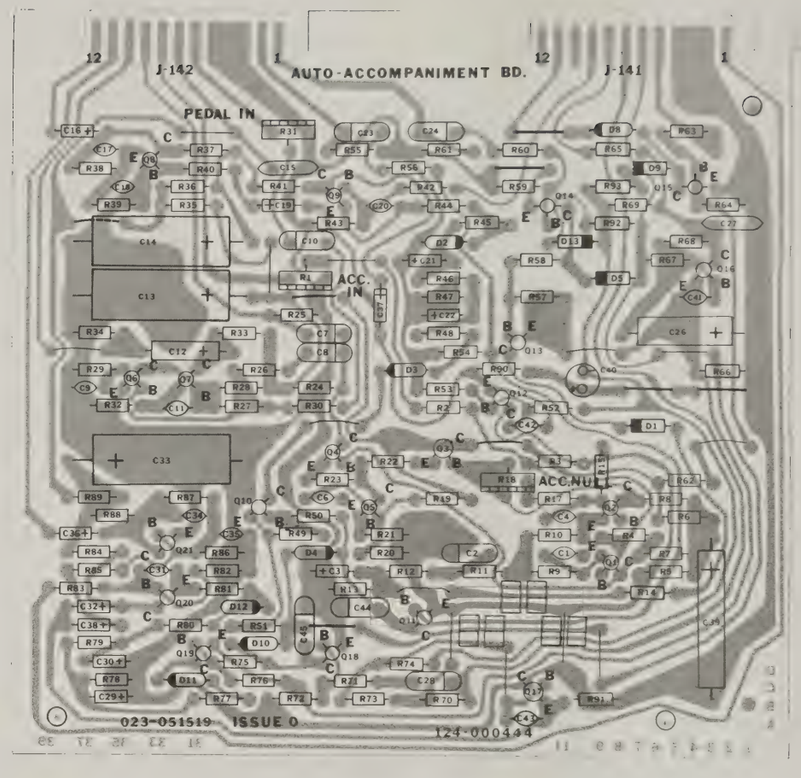
MISCELLANEOUS P.W. BOARD
124-000365
094-050003-0

18

FIGURE 3-22
MISCELLANEOUS BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000365)


ACC. AUTOCHORD GATE
ACC. & PEDAL MIXER
PEDAL INPUT
ACC. & PEDAL OUTPUT
16' PEDAL INPUT
16' PEDAL AUTOCHORD GATE
8' PEDAL AUTOCHORD GATE
PEDAL SNUBBER
PEDAL IN
GROUND TERMINALS
AUTO-ACCOMP. P. W. BOARD 124-000444
094-049900-E
NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE 1/2 WATT, 10% & THEIR VALUES ARE IN OHMS.
2. UNLESS OTHERWISE SPECIFIED, ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. SYMBOL (7) INDICATES PIN & IT'S NO. IN ONE OF THE TWO EDGE CONNECTORS: J140R J142.
REVISIONS
A INITIAL ISSUE

QTY	SEMICONDUCTOR SYMBOL	HAMMOND PART #	JEDEC PART #
2	Q1,Q2, MATCHED PAIR	001-021260-001	2N 5826
3	Q3,Q4,Q7	001-021133	2N 3394
1	Q5	001-021132	2N 3394
5	Q9,Q10,Q13,Q19,Q20	001-021135	2N 3394
3	Q6,Q8,Q21	001-021260	2N 5826
5	Q11,Q14,Q15,Q16,Q18	001-021172	2N 4249
2	Q12,Q17	001-021173	2N 4249
13	D1 THRU D13	001-026080	1N 4148



17

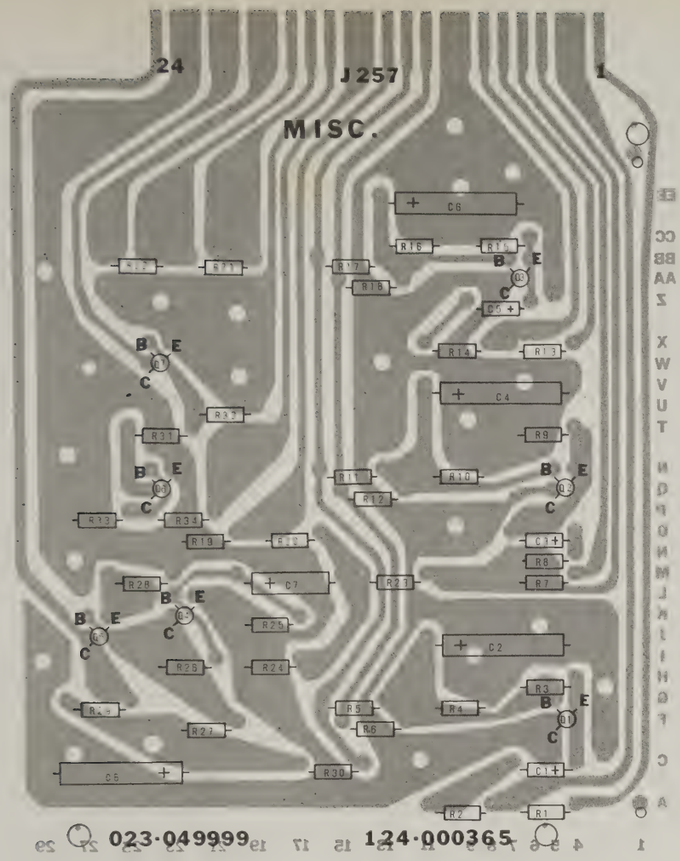
FIGURE 3-21
AUTO CHORD BOARD

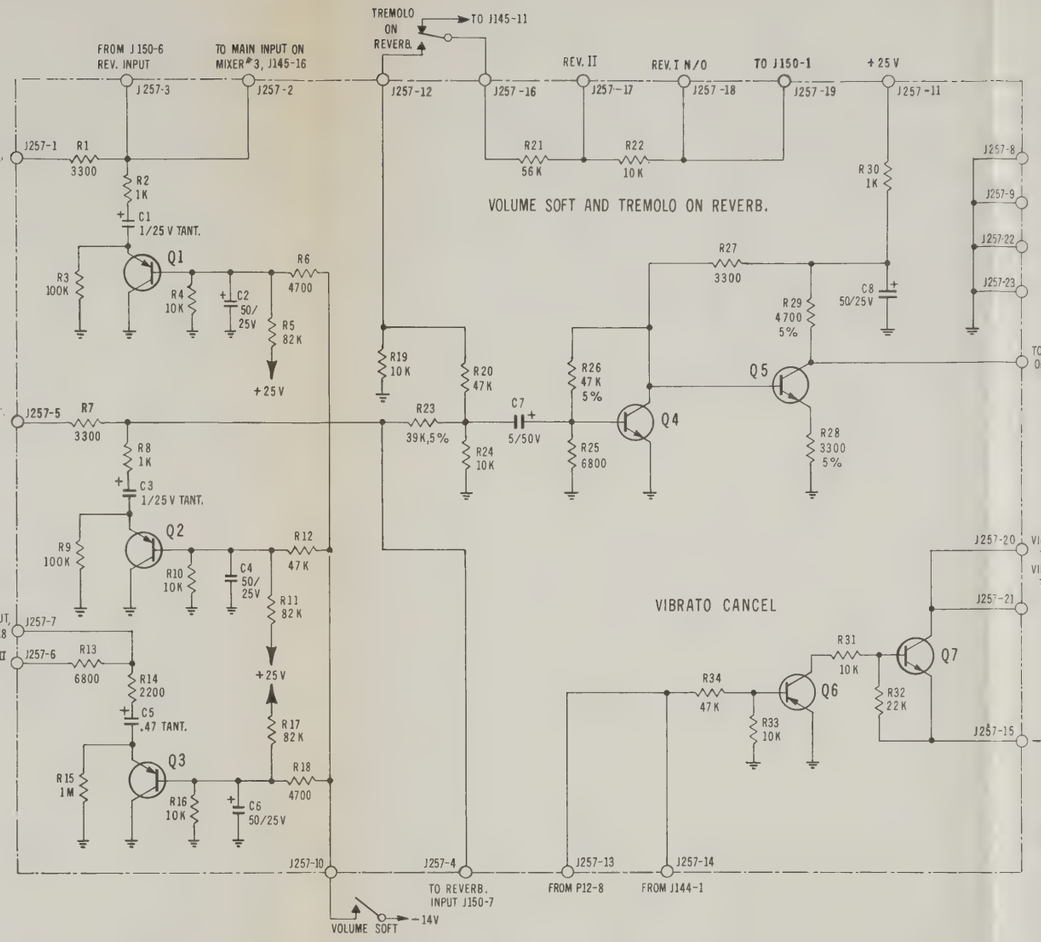
(124-000444)

124-000444 AUTO ACCOMP. BOARD

Auto Accompaniment Board 124-000444 is used to provide Auto accompaniment gating for the lower manual and pedals in response to triggers from a Rhythm Unit. Mixing of pedals and LM signals and pedal snubbing is also provided.

The Auto accompaniment gate for the lower manual is similar to the reiteration gate in PWB 124-000208, except that it provides a fixed time constant when triggered by a short pulse. Also, the gating signal is approximately twice the DC level present when autochord is off, so that there is no audible difference in loudness. The pedal gates are simpler, but thump in the absence of signal is prevented by key-down gating of the signal amplifiers.





NOTES:

1. UNLESS OTHERWISE SPECIFIED
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL ---○--- INDICATES EDGE CONNECTOR PIN NUMBER.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
4	Q1, Q2, Q3 & Q6	001-021172	2N4249
2	Q4, Q5	001-021133	2N3394
1	Q7	001-021260	2N5826

REVISIONS

MISCELLANEOUS P.W. BOARD
124-000365
094-050003-0

124-000365 MISCELLANEOUS BOARD

The Miscellaneous PWB 124-000365 is used to provide several unrelated functions - Volume Soft, Tremolo on Reverb, and Vibrato Cancel.

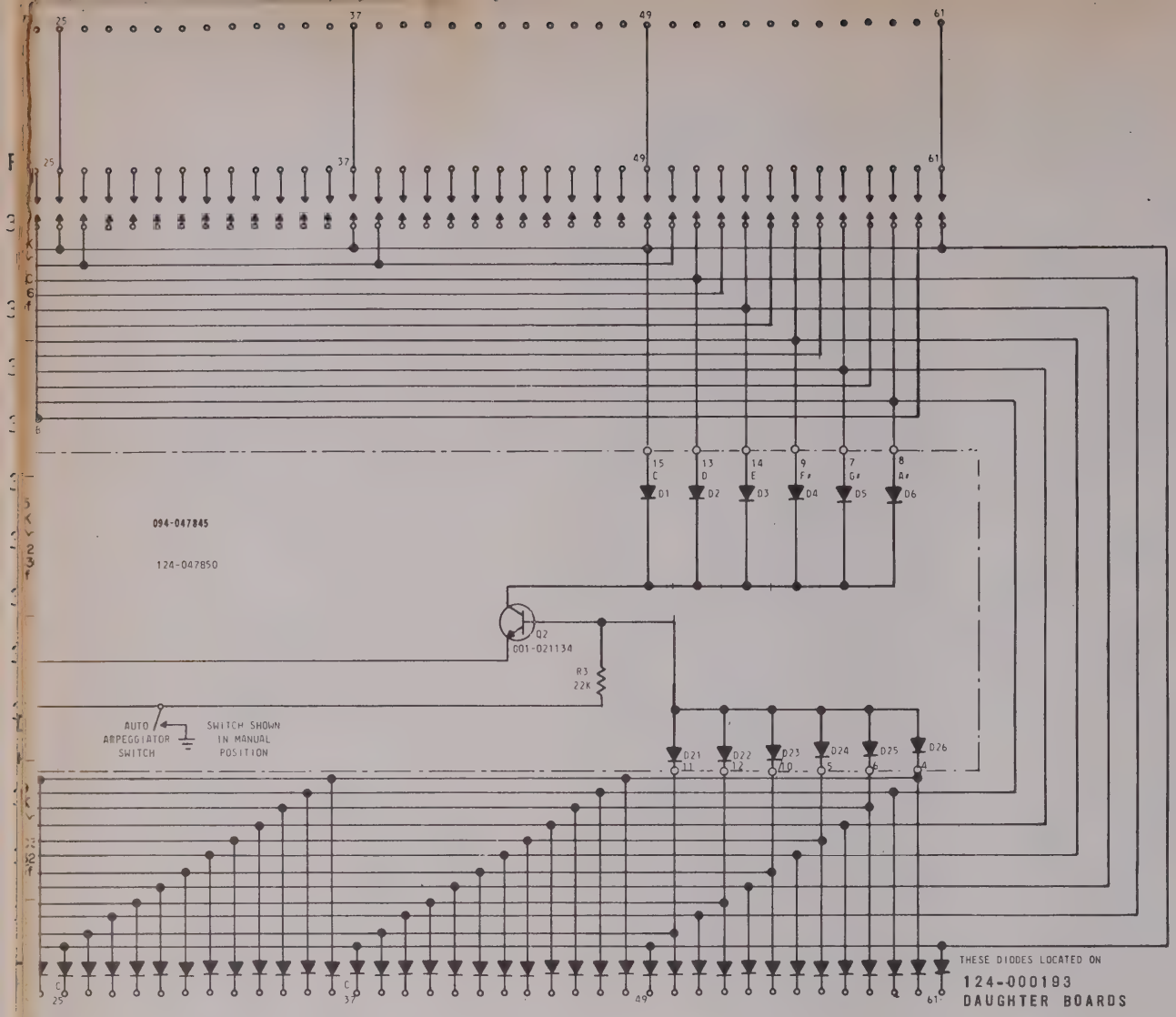
The volume soft function is an electronic 3-pole switch. When the volume soft tab switch is closed, -14 V is applied through J-267-10 to turn on switch transistors Q1, Q2 and Q3, which are connected in the inverted mode. When these transistors are conducting a 10 db voltage divider is placed in each of three channels, Main, Tremolo, and Rhythm high frequencies. These are capacitors within the dividers which cause attenuation to be less at low frequencies for loudness contouring.

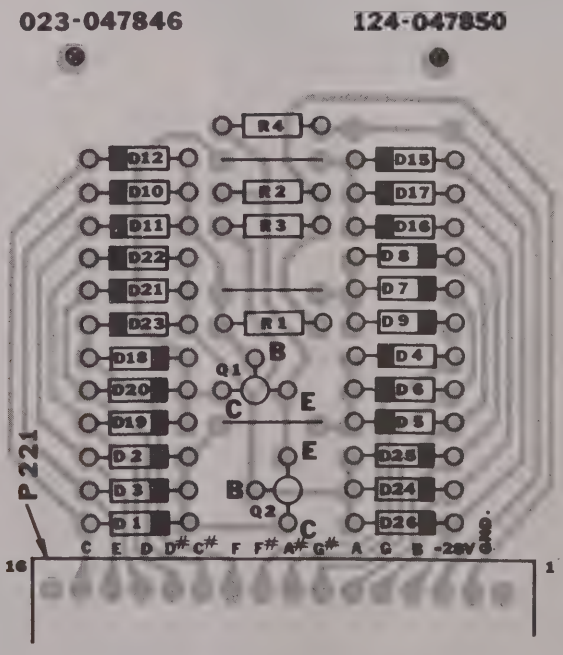
A non-inverting mixer (Q4 and Q5) is provided in order to mix reverberated signal into the Tremolo channel when Tremolo on Reverb is desired.

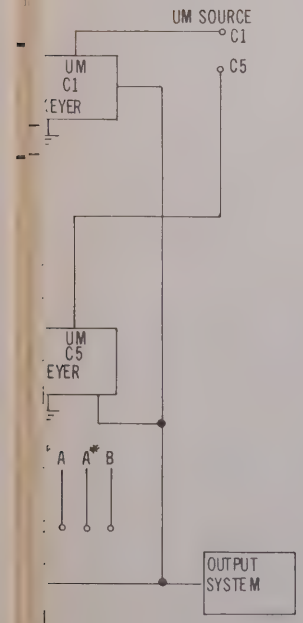
Q6 and Q7 form an electronic switch to turn off vibrato on the MDD board, 124-000265, by shorting it to the -28 volt line without the -28 volts affecting other circuitry which has to be connected to the foot switch.

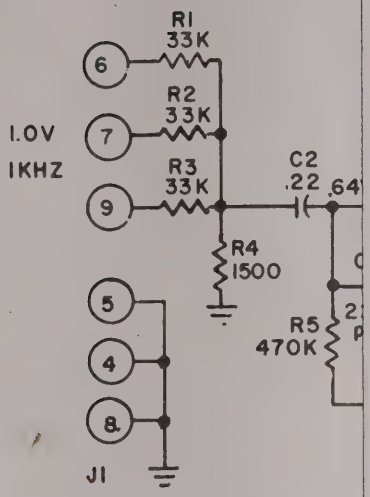
18

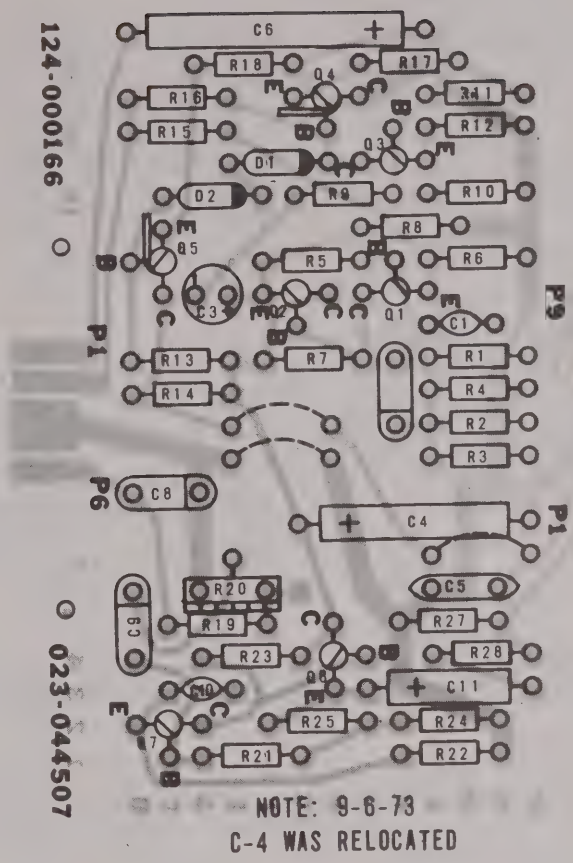
FIGURE 3-22
MISCELLANEOUS BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000365)


094-047845
124-047850
Q2
001-021134
R3
22K
AUTO ARPEGGIATOR SWITCH
SWITCH SHOWN IN MANUAL POSITION
THESE DIODES LOCATED ON
124-000193
DAUGHTER BOARDS


023-047846
124-047850
P 221
16
1


UM SOURCE
C1
C5
OUTPUT SYSTEM





REVERBERATION BOARD 1

Signal is fed through
through C2 to the bas
through R5. From the
coupled directly to t
Bias for Q2 is provid
the emitter of Q2 is
by C3 and R9 to the b
through R11. From Q3
in half-wave position
prised of Q4 and Q5.
nal is coupled direct
Forward bias on D1 an
tion of the signal fr
tion of the signal is
bias D1 and D2, and t
passed to the base of
two transistors are c
and R18, and coupled

FIGURE 3-24
REVERBERATION BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000166)

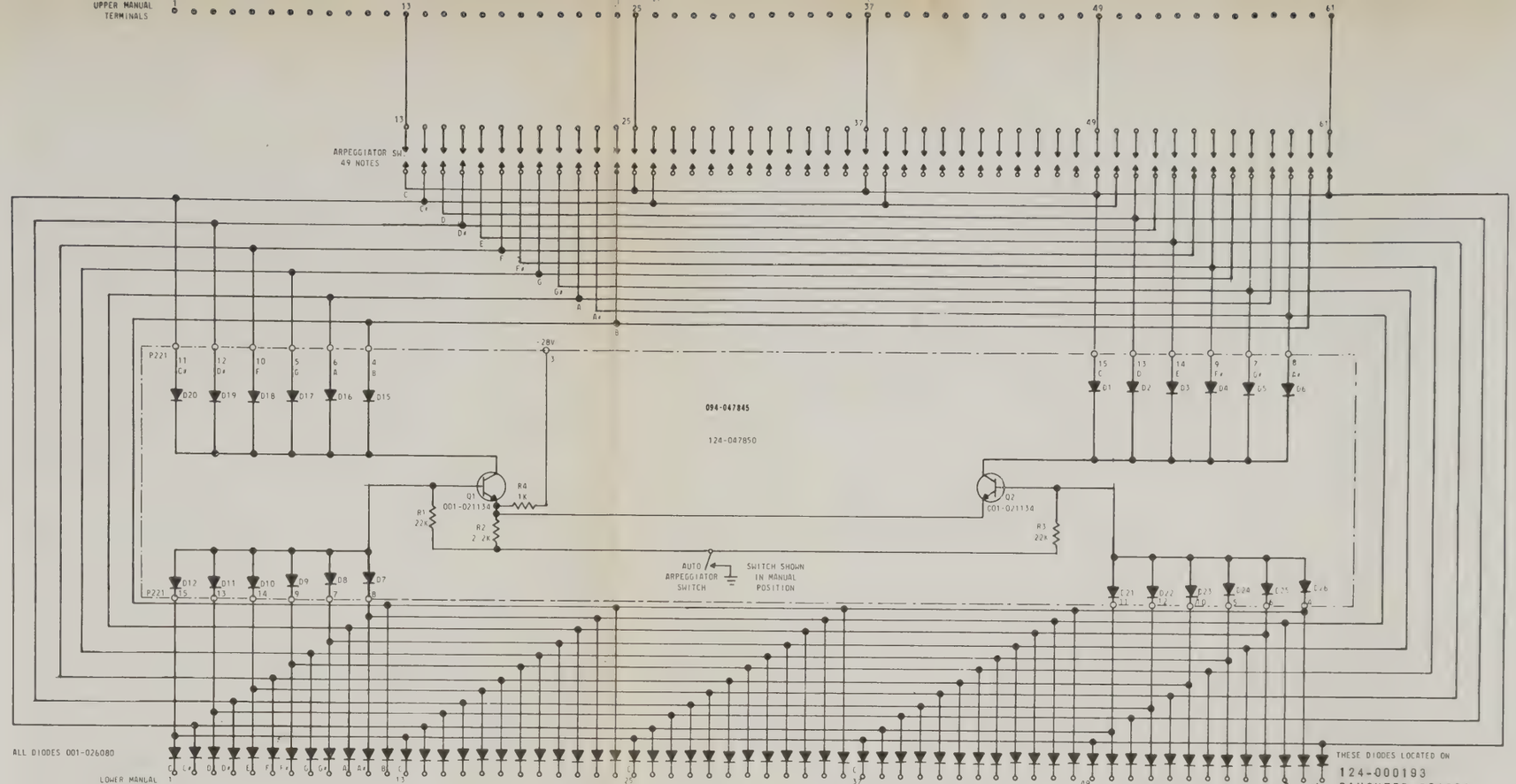
124-047850 ARPEGGIATOR BOARD

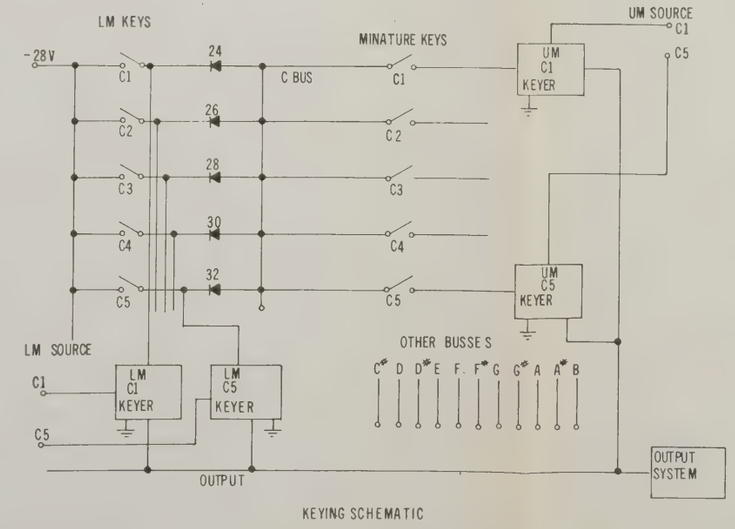
An electronic system for producing an Arpeggio, Glissando, or whole tone scale as desired, by stroking a miniature keyboard under a mylar strip located between the manuals. Next to the strip is a switch that selects between MANUAL and AUTOMATIC modes. In the MANUAL mode, ground is disconnected from Q1 and Q2, through R2 and R3. The keys depressed on the lower manual determine which notes registered on the upper manual will be heard, including those in octave relation thereto. If no lower manual keys are activated, the Arpeggiator strip is dead. Twelve circuits are used, one for each note of the scale. Diodes D24 thru D32 activate the "C" buss whenever a "C" note is keyed on the lower manual while providing isolation between the lower manual keyers, similarly, the "C#", "D", "D#", etc., busses will activate when these notes are played. Keying a buss will apply voltage on all octaves of that note on the Arpeggiator switches. Now if the Apreggiator is stroked, all octaves of the notes held on the lower manual will sound in succession as if they had been played on the upper manual, due to the connection of the Arpeggiator switches to the upper manual keyers.

OPERATING IN AUTOMATIC MODE:

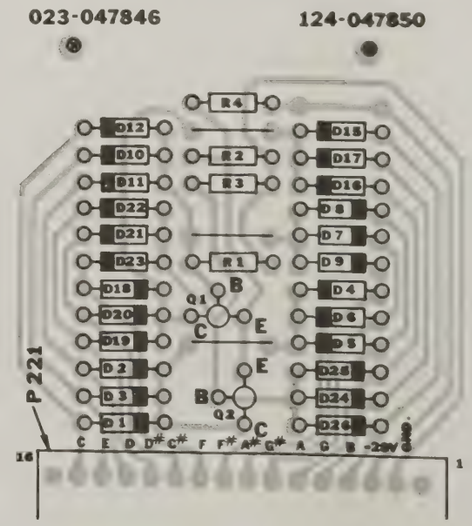
Q1 and Q2 are normally turned on by grounding their bases through R2 and R3, supplying -18V to all keying busses from the emitters through the collectors and diodes D1 through D6 and D15 through D20. (When no keys are depressed on the lower manual). This activates all busses at slightly less than full keying voltage. When the Arpeggiator strip is stroked, all notes play in succession (GLISSANDO). If notes in the SAME whole tone scale are depressed, -28V will be applied to the base of the associated transistor, turning it off and removing the -18V from the busses for the other whole tone scale. Only the proper whole tone scale, in tune with notes depressed, will play. If a chord is keyed on the lower manual that has notes in BOTH whole tone scales, busses are activated with -28V on left and right sides, reverse biasing both transistors so only the busses for the notes depressed on the lower manual are activated. Consequently, only corresponding notes on the Arpeggiator become playable. Therefore, when the miniature keyboard is stroked, a Glissando occurs if no lower manual keys are depressed, and an Arpeggio is heard if one or more keys are held, but always in harmony with those keys.

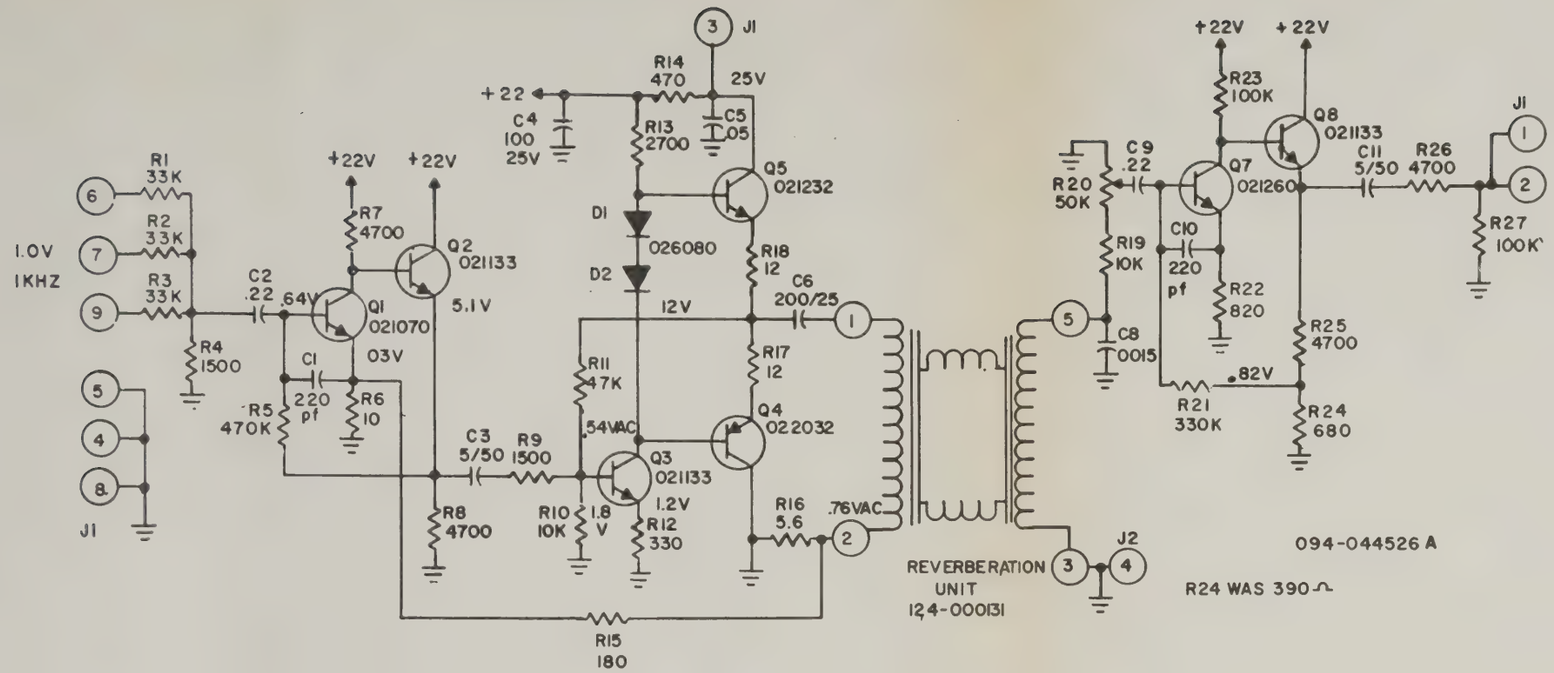
FIGURE 3-23
ARPEGGIATOR BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-047850)

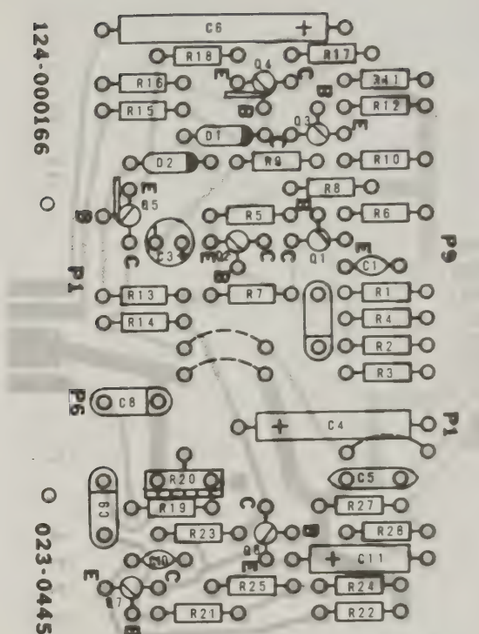




KEYING SCHEMATIC







REVERBERATION BOARD 124-000166

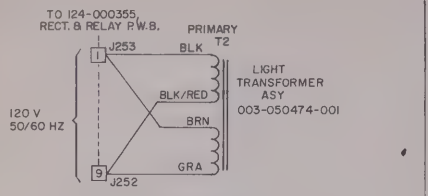
Signal is fed through R1, R2, or R3 and coupled through C2 to the base of Q1. Bias for Q1 is supplied through R5. From the collector of Q1, the signal is coupled directly to the base of emitter follower Q2. Bias for Q2 is provided through R7. The signal from the emitter of Q2 is developed across R8 and coupled by C3 and R9 to the base of Q3. Bias for Q3 is supplied through R11. From Q3 collector the signal is coupled in half-wave position to the push-pull amplifier comprised of Q4 and Q5. The negative portion of the signal is coupled directly to the base of Q4, a PNP. Forward bias on D1 and D2 prevents the negative portion of the signal from reaching Q5. The positive portion of the signal is of sufficient amplitude to reverse bias D1 and D2, and this portion of the signal is then passed to the base of Q5, an NPN. The outputs of the two transistors are combined at the junction of R17 and R18, and coupled through C6 and J2-1, to drive the reverberation unit whose input is connected to this point. Negative degenerative feedback is taken from R16, and connected through R15 to the emitter of Q1.

REVERBERATION RECOVERY

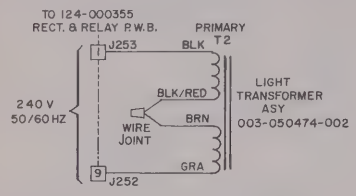
Through a reverberation unit there is considerable loss of signal strength. Therefore, the output of the unit must be amplified to restore the signal to sufficient amplitude to drive a power amplifier.

The signal from the reverberation unit at J2-5 is coupled through R19, R20, and C9 to the base of Q7. Bias and feedback for Q7 are supplied through R21. The output at Q7 collector is coupled directly to the base of Q8. The signal of the reverberation recovery at the emitter of Q8 is coupled to J1-1 through C11 and R26. Resistor R26 is part of a Reverb. Volume control.

FIGURE 3-24
REVERBERATION BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000166)

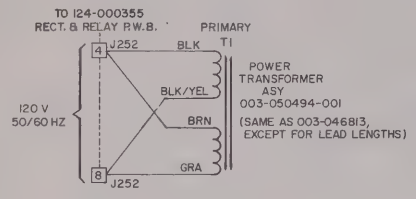


FOR POWER SUPPLY ASY 126-000107/108-002

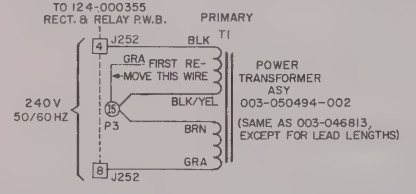


FOR POWER SUPPLY ASY 126-000107/108-003

LIGHT TRANSFORMER ASYS



FOR POWER SUPPLY ASY 126-000107/108-002



FOR POWER SUPPLY ASY 126-000107/108-003

POWER TRANSFORMER ASYS

PRIMARY CONNECTIONS OF TRANSFORMERS,
USED IN POWER SUPPLY ASYS FOR EXPORT.

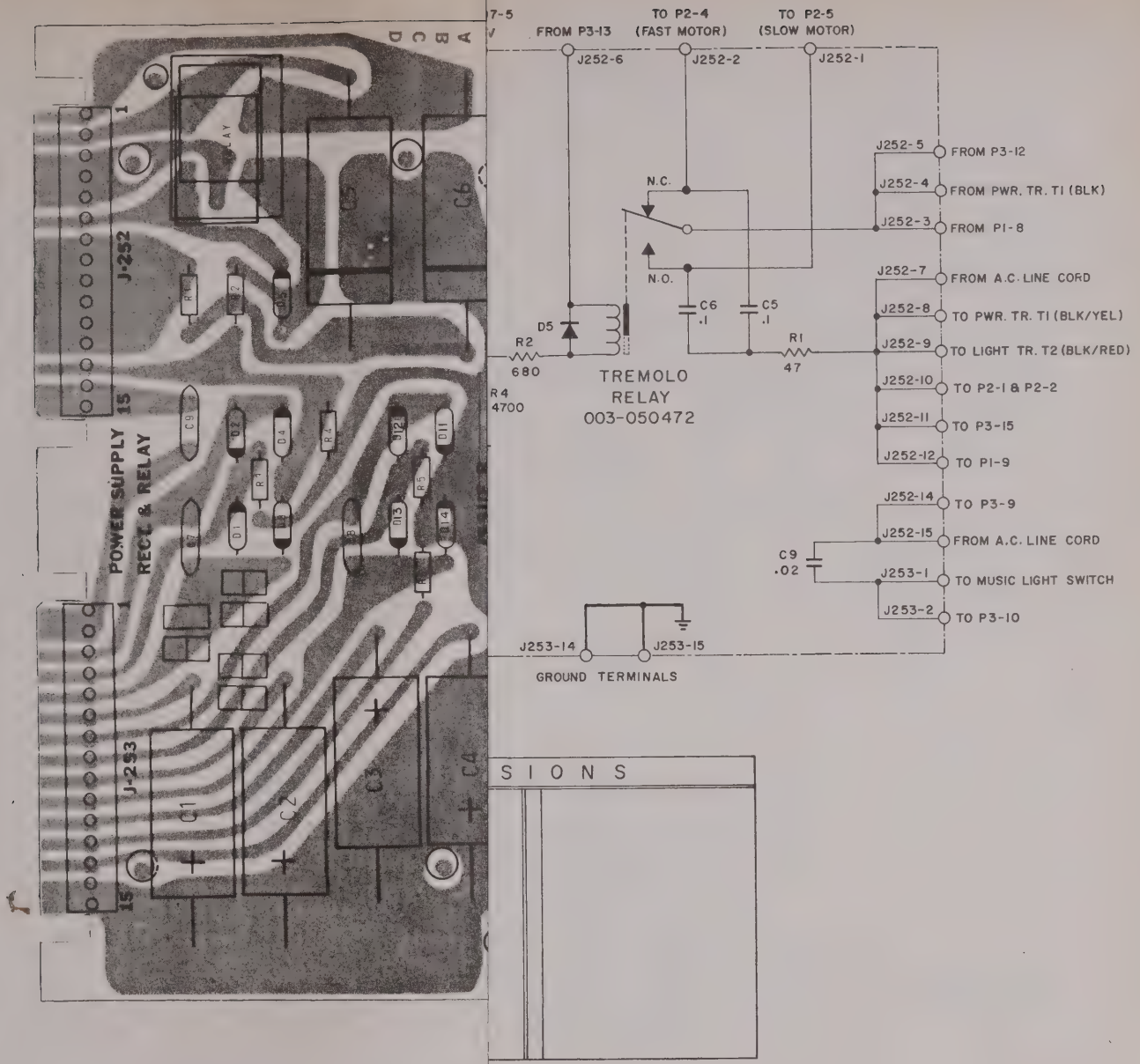
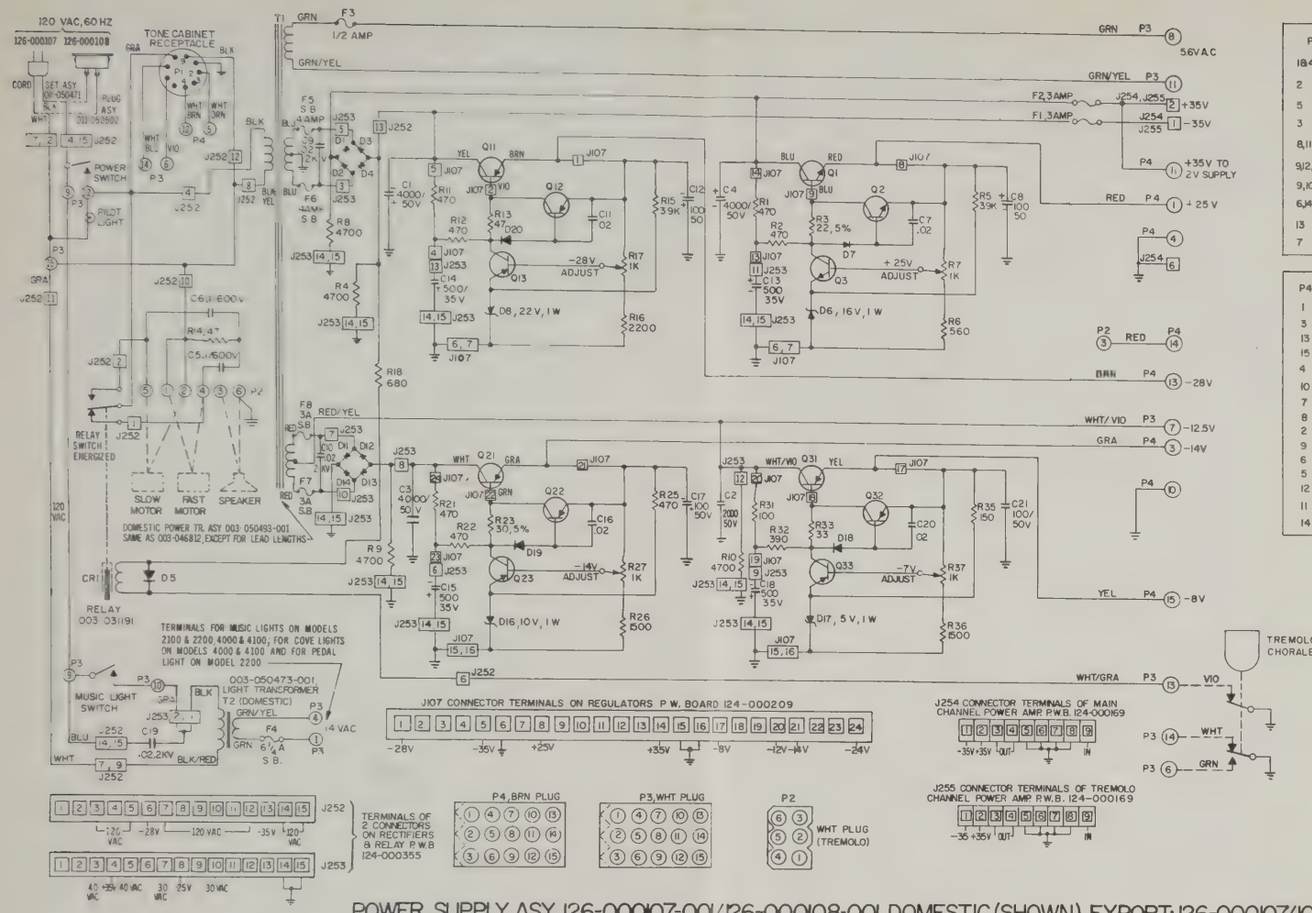


FIGURE 3-26
RECTIFIER AND RELAY BOARD
(124-000385)

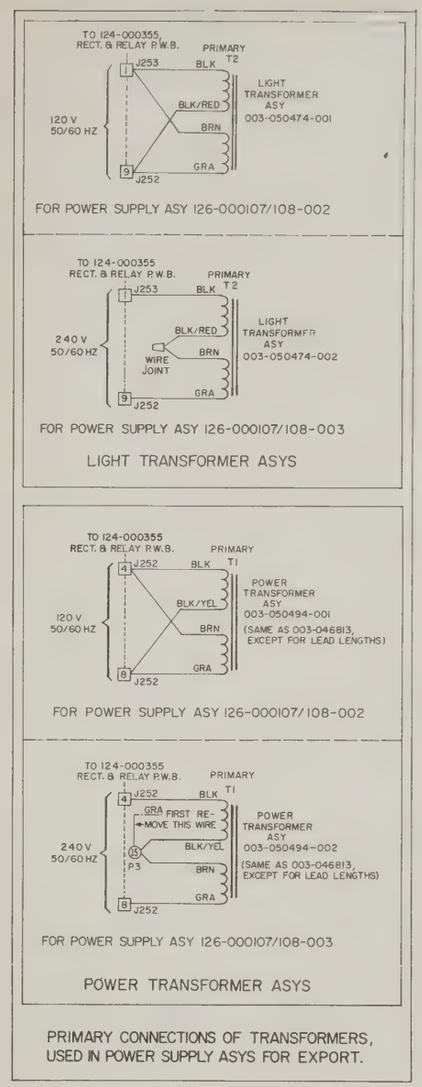

120 VAC, 60 HZ
TONE CABINET RECEPTACLE
POWER SWITCH
PILOT LIGHT
RELAY SWITCH ENERGIZED
SLOW MOTOR
FAST MOTOR
SPEAKER
DOMESTIC POWER TR. ASY 003-050493-001 SAME AS 003-046812, EXCEPT FOR LEAD LENGTHS
RELAY 003-031191
TERMINALS FOR MUSIC LIGHTS ON MODELS 2100 & 2200, 4000 & 4100; FOR COVE LIGHTS ON MODELS 4000 & 4100 AND FOR PEDAL LIGHT ON MODEL 2200
MUSIC LIGHT SWITCH
003-050473-001 LIGHT TRANSFORMER T2 (DOMESTIC)
14 VAC
J107 CONNECTOR TERMINALS ON REGULATORS P.W. BOARD 124-000209
-28V -35V +25V +35V -8V -12V -14V -24V
J254 CONNECTOR TERMINALS OF MAIN CHANNEL POWER AMP. P.W.B. 124-000169
-35V +35V OUT IN
J255 CONNECTOR TERMINALS OF TREMOLO CHANNEL POWER AMP. P.W.B. 124-000169
TREMOLO CHORALE
WHT/GRA P3 13 VIO
P3 14 WHT
P3 6 GRN
P4,BRN PLUG
P3,WHT PLUG
P2
WHT PLUG (TREMOLO)
TERMINALS OF 2 CONNECTORS ON RECTIFIERS & RELAY P.W.B 124-000355
56VAC
+35V
-35V
+35V TO 2V SUPPLY
+25 V
-28V
-12.5V
-14V
-8V

P3 TERMINAL FUNCTIONS

1&4	COVE LIGHT & MUSIC LIGHT (SEE NOTATION AT T2)
2	MAIN CHANNEL OUTPUT
5	TREMOLO CHANNEL OUTPUT
3	MAIN SPEAKER GND
8,11	EXPRESSION PEDAL 56VAC
9,12,15	POWER SWITCH
9,10	LIGHT SWITCH
6,14	TONE CABINET CHORALE
13	TREMOLO RELAY
7	-12.5V CASSETTE SUPPLY

P4 TERMINAL FUNCTIONS

1	+25V D.C
3	-14V D.C
13	-28V D.C
15	-8V D.C
4 & 11	GNDS (+25,-28V)
10 & 12	GNDS (-14,-7V)
7	PHONO INPUT
8	GND (PHONO)
2	TREMOLO CHANNEL INPUT
9	MAIN CHANNEL INPUT
6	GND (INPUTS)
5, 12	TONE CABINET INPUTS
11	+35 V.D.C.
14	TREMOLO SPEAKER


TO 124-000355 RECT. & RELAY P.W.B.
PRIMARY T2
120 V 50/60 HZ
LIGHT TRANSFORMER ASY 003-050474-001
FOR POWER SUPPLY ASY 126-000107/108-002
240 V 50/60 HZ
WIRE JOINT
LIGHT TRANSFORMER ASY 003-050474-002
FOR POWER SUPPLY ASY 126-000107/108-003
LIGHT TRANSFORMER ASYS
T1
POWER TRANSFORMER ASY 003-050494-001
(SAME AS 003-046813, EXCEPT FOR LEAD LENGTHS)
FOR POWER SUPPLY ASY 126-000107/108-002
GRA FIRST RE-MOVE THIS WIRE
POWER TRANSFORMER ASY 003-050494-002
(SAME AS 003-046813, EXCEPT FOR LEAD LENGTHS)
FOR POWER SUPPLY ASY 126-000107/108-003
POWER TRANSFORMER ASYS

PRIMARY CONNECTIONS OF TRANSFORMERS, USED IN POWER SUPPLY ASYS FOR EXPORT.

POWER SUPPLY ASY 126-000107-001/126-000108-001, DOMESTIC (SHOWN). EXPORT: 126-000107/108-002 & 003.

094-050625-B

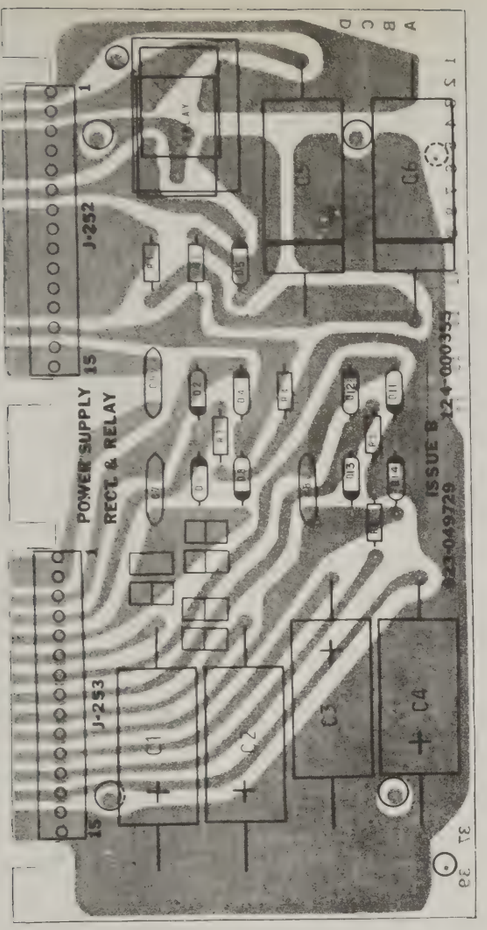
NOTES:

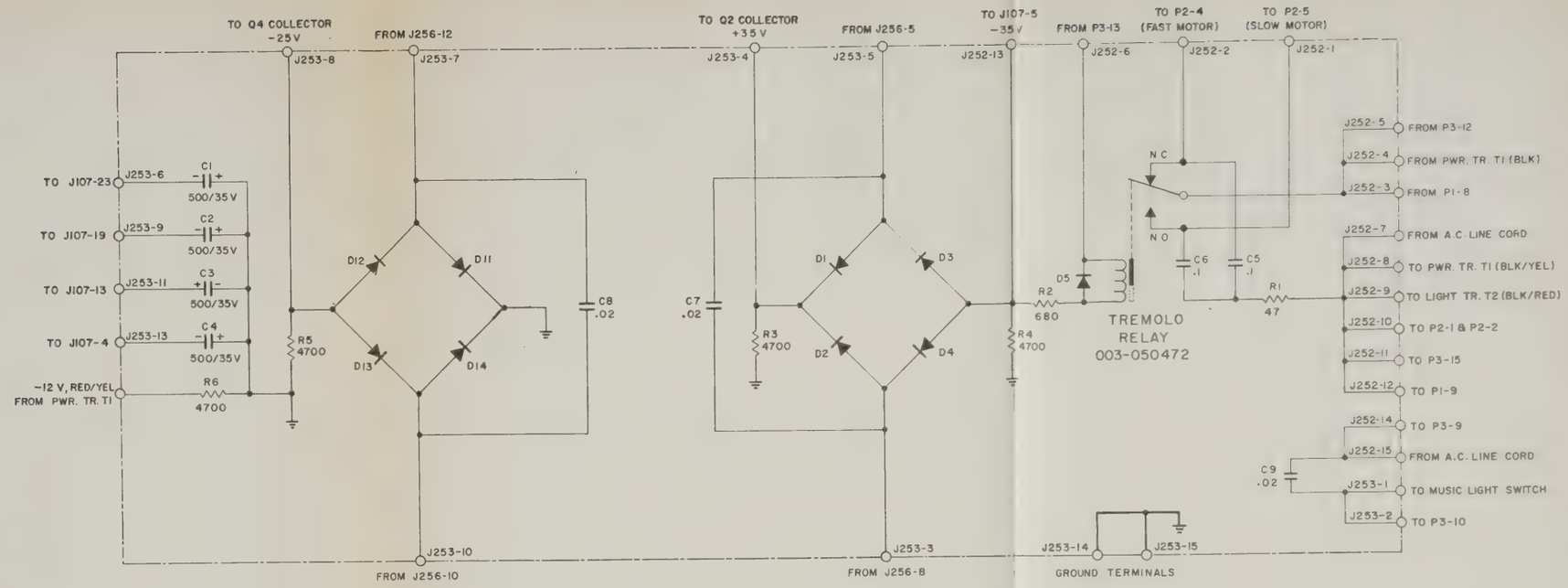
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS;
   ALL SWITCHES ARE IN "OFF" POSITION.
2. SYMBOL INDICATES:
   "②P3" PIN 2 IN PLUG P3;
   "③J107" PIN 3 IN P.W. BOARD EDGE CONNECTOR J107.
   "14,15 / J252" TWO (OR MORE) INTERCONNECTED PINS 14 AND 15 ON P.W. BOARD EDGE CONNECTOR J252.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
1	Q1	001-021270	2N 3055
1	Q2	001-021260	2N 5826
1	Q3	001-021133	2N 3394
3	Q11, Q21, Q31	001-022070	2N 4904
6	Q12, Q13, Q22, Q23, Q32, Q33	001-021172	2N 4249
8	D1 THRU D4 & D11 THRU D14	001-024061	IN 4720
1	D5	001-024051	IN 4002
1	D6, ZENER, 16 V, 1W	001-023038	IN 4745
4	D7, D18, D19, D20	001-026080	IN 4148
1	D8, ZENER, 22 V, 1W	001-023031	IN 3028
1	D16, ZENER, 10 V, 1W	001-023035	IN 4740
1	D17, ZENER, 5 V, 1W	001-023030	IN 4733

REVISIONS

FIGURE 3-25
POWER SUPPLY ASSEMBLY
SCHEMATIC AND LAYOUT
(124-000209)





NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL INDICATES TERMINAL & IT'S NO. IN ONE OF THE TWO CONNECTORS: J252 OR J253.
3. ALL REFERENCE TERMINALS ("TO" & "FROM") ARE LOCATED ON COMPONENTS WITHIN POWER SUPPLY ASSEMBLY.

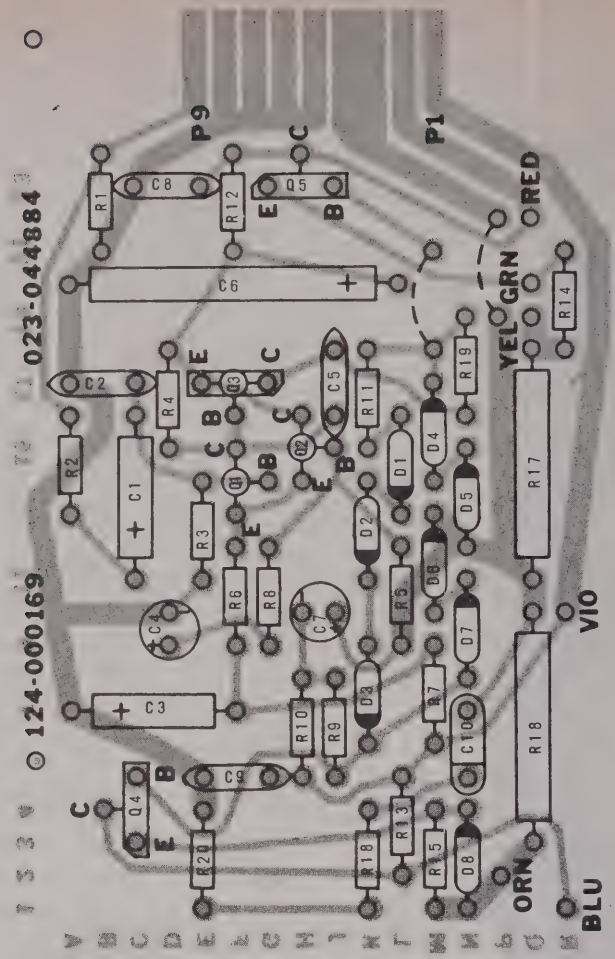
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
5	D1 THRU D5	001-024051	IN 4002
4	D6 THRU D9	001-024061	IN 4720

RECTIFIERS & RELAY P.W. BOARD
124-000355

094-049735-0

REVISIONS

FIGURE 3-26
RECTIFIER AND RELAY BOARD
(124-000385)

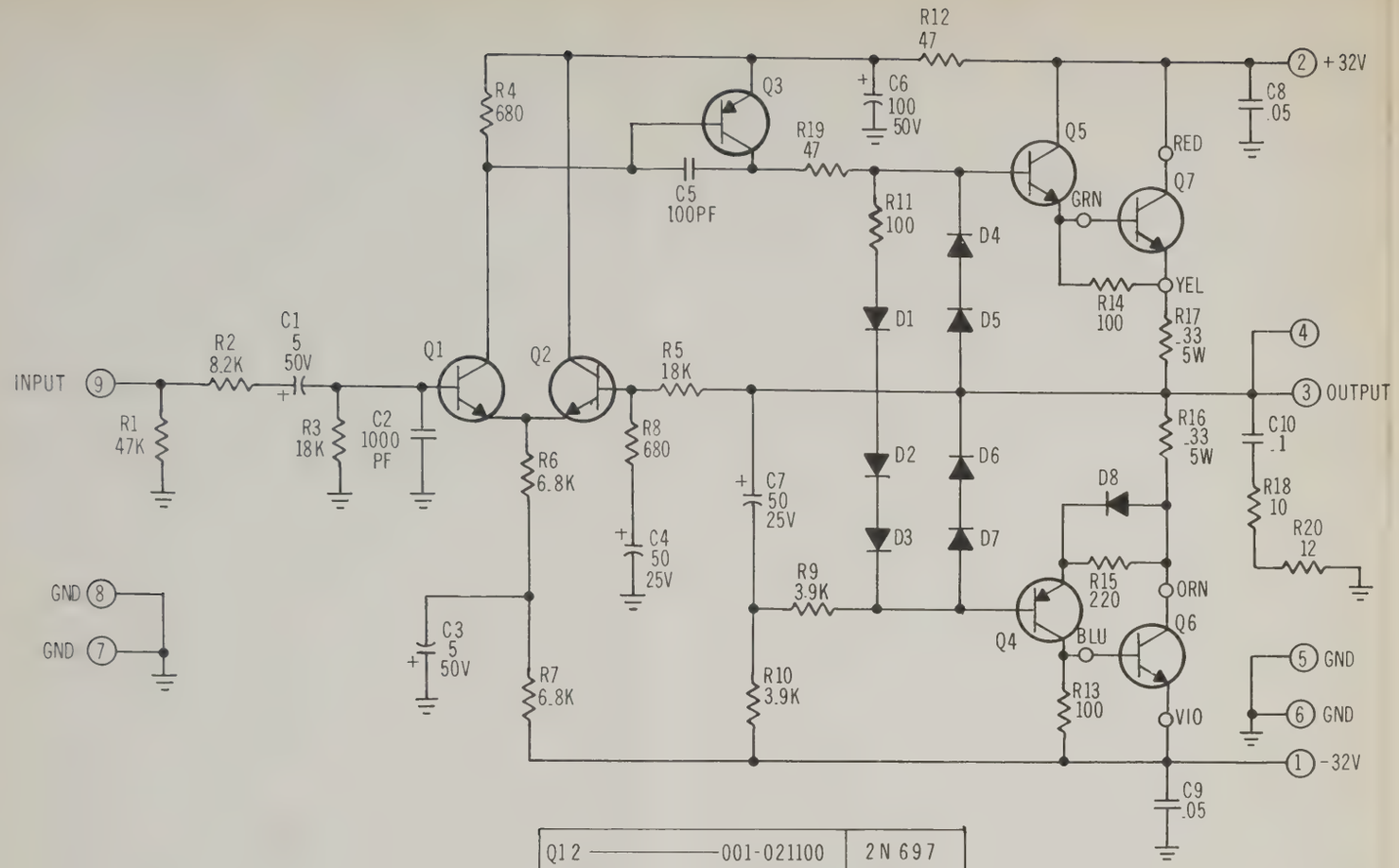


3, represent part of the
the important function of
. In order for Q6 and Q7
lrops across D1, D2, and
ops across the emitters
ps across D8, R16, and
e three series diodes is de-
id this current, in turn,
across the diodes. A Q6,
oximately 40 Ma is nec-
istortion.

PN Darlington connected,
NP Darlington connection.
he overall transconduc-
arly the same as that of
g the linearity of the out-
tor C7 is connected be-

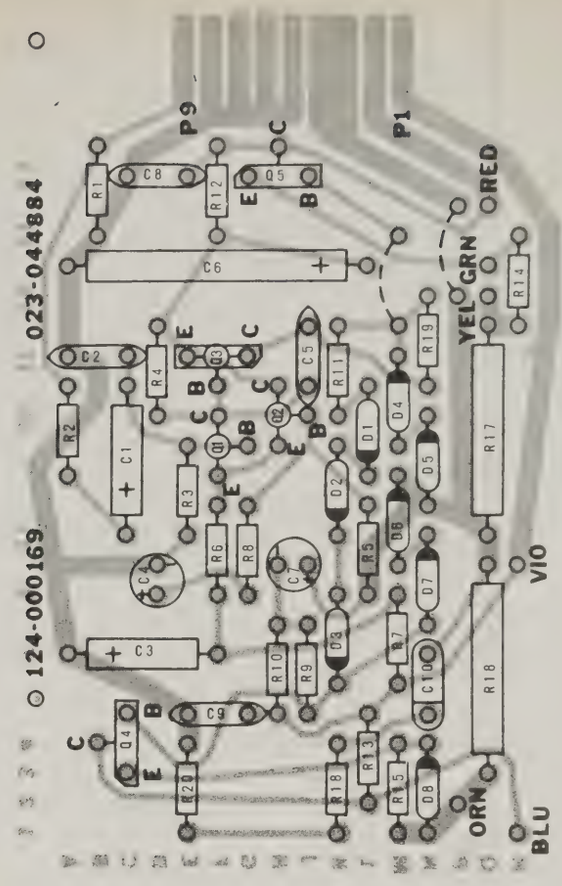
between R9 and R10 enabling Q6 to be driven into saturation. Without the positive feedback path through C7, there is insufficient drive to Q6 for symmetrical output.

RC pad R18, and C10 across the load provides high frequency stabilization. Short-circuit protection is accomplished during the positive cycle by series-connected diodes D1 to D6, in parallel with Q4 and Q5 emitters and R17. The diodes shunt the drive to Q7 and clamp its collector current at a level just above the normal peak load current. The collector current of Q6 is clamped during the negative cycle in the same manner as that of Q7 with diodes D5 and D3.



Q1 2	001-021100	2N697
Q3	001-022040	MOT 4000
Q4	001-022050	D43C8
Q5	001-021240	D4268
Q6 7	001-021270	2N3055
D1THRU8	001-026080	1N4148

124-000169
094-044907-B



35 WATT POWER AMP MODULE

A differential amplifier used for the input circuit keeps the output at D.C. ground by compensating the bias of the output transistors. This circuit makes quasi-complementary output practical by eliminating the bias problems. Transistors Q1 and Q2 are biased equally to ground with R3 and R5. Since the load is connected to the base of Q2 through R5, ground potential is achieved at the load.

The D.C. feedback path from the load to the base of Q2 also presents a convenient way to apply A.C. feedback. The amount of feedback is controlled by R8 and R5 and their ratio determines the overall gain of the amplifier. The high open loop gain, which permits the large negative feedback, is due to transistor Q3 which operates class A with its emitter at A.C. ground. This means that Q3 must withstand the total voltage across the amplifier.

Three diodes, D1, D2, and D3, represent part of the load seen by Q3 and perform the important function of biasing the output transistors. In order for Q6 and Q7 to be biased on, the voltage drops across D1, D2, and D3 must equal the voltage drops across the emitters Q4, Q5, and Q7 plus the drops across D8, R16, and R17. The current through the three series diodes is determined by R9, and R10, and this current, in turn, determines the voltage drop across the diodes. A Q6, Q7 quiescent current of approximately 40 Ma is necessary to prevent crossover distortion.

Transistors Q5 and Q7 are NPN Darlington connected, while Q4 and Q6 act like a PNP Darlington connection. Resistor R15 and D8 causes the overall transconductance of Q4 and Q6 to be nearly the same as that of Q5 and Q7 thereby improving the linearity of the output stage. A bootstrap capacitor C7 is connected between R9 and R10 enabling Q6 to be driven into saturation. Without the positive feedback path through C7, there is insufficient drive to Q6 for symmetrical output.

RC pad R18, and C10 across the load provides high frequency stabilization. Short-circuit protection is accomplished during the positive cycle by series-connected diodes D1 to D6, in parallel with Q4 and Q5 emitters and R17. The diodes shunt the drive to Q7 and clamp its collector current at a level just above the normal peak load current. The collector current of Q6 is clamped during the negative cycle in the same manner as that of Q7 with diodes D5 and D3.

FIGURE 3-27
35 WATT AMP BOARD
SCHEMATI, LAYOUT AND THEORY
(124-000169)

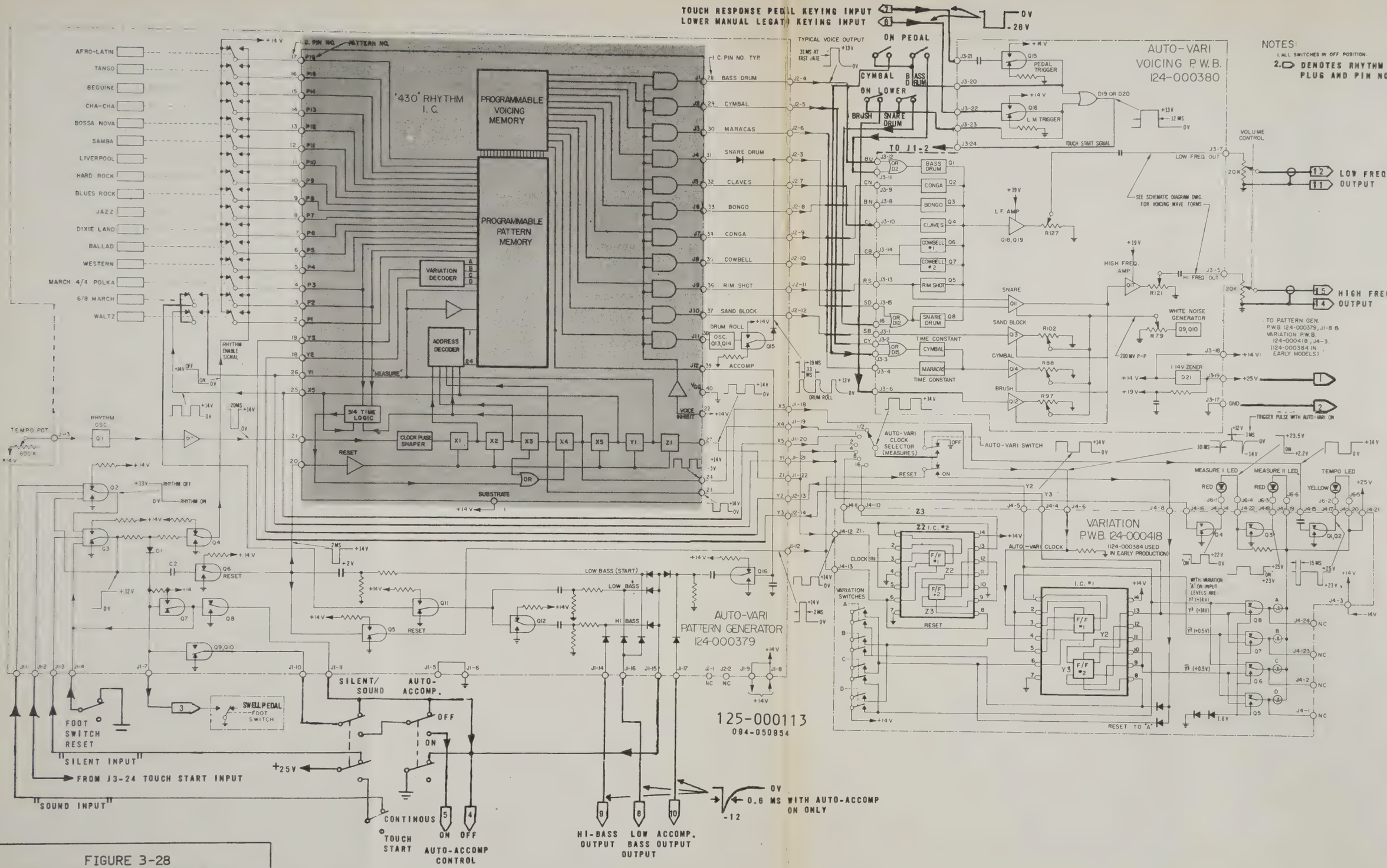
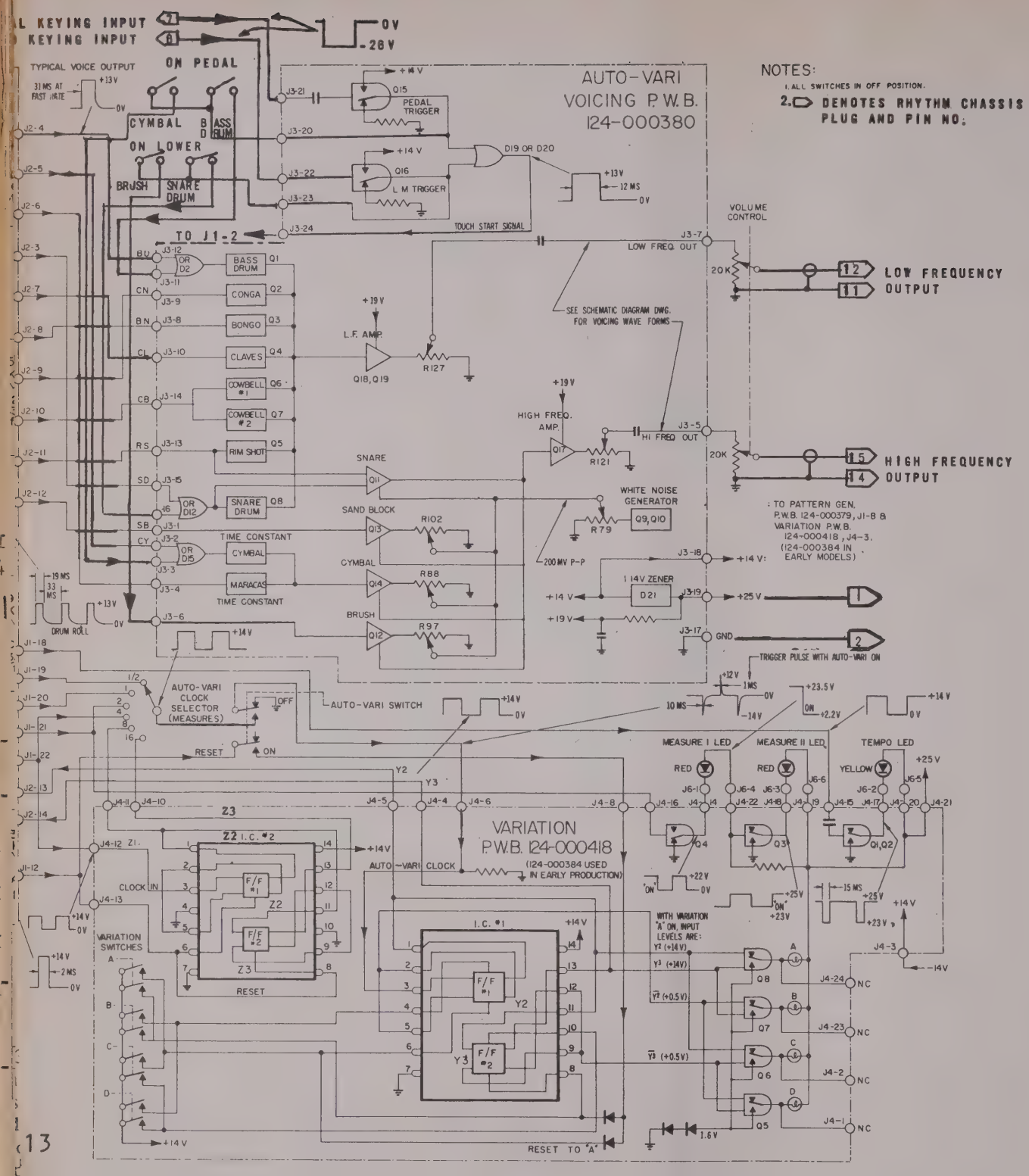


FIGURE 3-28
AUTO VARI 64 - RHYTHM UNIT
LOGIC DIAGRAM



WITH AUTO-ACCOMP ON ONLY

1) GENERAL.--This section contains th
the Auto Vari Rhythm Units. There
The Accessory Model, which is a s
its own power source, but does req
and speaker. This unit does not c
iment feature or the play along vo
features should be excluded when u
Accessory Model.

The In-Built Version, which is ass
the complete organ. The Rhythm Un
identical in the organ models it i
el and mountings will differ due t
or. The In-Built does contain the
play along voices.

The Auto Vari has sixteen Rhythm p
16 interlocking push buttons which
ularly or in combinations. Two of
time Rhythm patterns, and other fo
4/4 time Rhythm patterns.

2) PATTERN GENERATOR BOARD - 124-0003
contains the 075-000430 custom Rhy
ally the heart of the Auto Vari 64
mable pattern memory, sixteen D.C.
puts, twelve outputs for eleven vo
paniment signal. There is a separ
disable the eleven voice outputs.
this Rhythm unit. There is a cloc
drive the internal decoding circui
quency varies from 4.8 HZ to 30 HZ
address decoder. The five counter
address decoder are designated X1
X4 and X5 outputs brought out of t
divider Y1 which in turn drives th
Y1 feeds Divider Z1 which provides
outputs for driving the variation
the two 3/4 time patterns is activ
automatically changes the address
measure to an 18 count measure. T
control inputs which are fed by di
variation board (123-000418). The
these inputs into one of four poss
tempo of the Rhythm Unit is contro
tiometer located on the front pane
tempo control is connected to J1-1
of charging current for capacitor
C1 will increase until it is great
junction of R5 and R6. Transistor
junction transistor, will then tur
resistor R4. This discharge curre
tor Q17, which is used to amplify
+14 volt signal required to drive
Rhythm I.C.

Transistors Q2 and Q3 from a "Set-
and starts the Rhythm Generator.

If either 3/4 time rhythm button is depressed, the
o Q11 will be disconnected and Q11 will be connected
divider output. The Y1 divider output (1/2 cycle per measure)
ss note to sound at the beginning of measure 1
gh bass note to sound at the beginning of measure
gh bass, low bass, and accompaniment organ sig-
hunted to ground through diodes D13, D4, D5 and
he Auto-Accompaniment switch is "off".

s Q13 and Q14 form an astable multi-vibrator with
y of approximately 20 HZ. This astable is turned
r the Rhythm I.C. supplies a +14 volt drum roll
m I.C. pin #38. The output of the astable is amp-
transistor Q15 which supplies a low impedance
) signal to the snare drum output through diode D9.

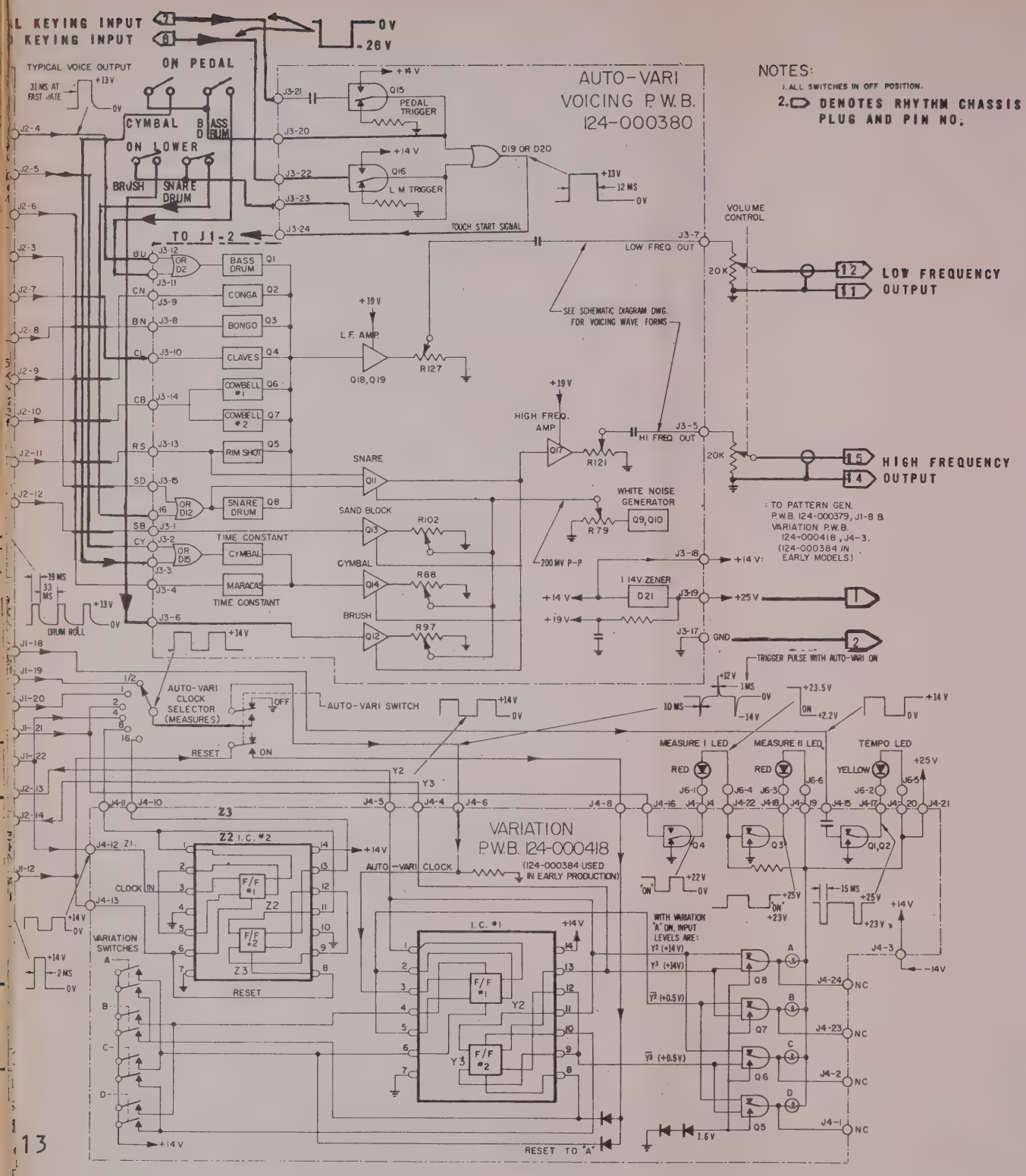
ice outputs (J2-3 through J2-12) are connected
o the I.C. voice output pins. These outputs pro-
mpedance (2,000-ohm) positive-going drive pulses
wired directly to the voicing circuits on the
voicing board.

BOARD - 124-000418--The Variation Board provides
ing circuits:
cascaded dividers which provide the "8" and "16"
ure signals for the Autovari measures switch, Z1, Z2,
r-station lighted pushbutton switch assembly
associated I.C. divider, decoding circuits and
ation switch lamp amplifiers.
sistor lamp amplifier for Tempo, Measure I and
re II.

al D" divider package (I.C. 2) is used to provide
d "16" measure signals for the automatic varia-
The first divider input, Z1-Pin 12, is connected
o the Z1 output of the Pattern Generator Board.
ivider output (Z2) is one half the frequency of
and Z3 is one fourth the frequency of the input.
s are +14 volts square waves which are wired dir-
he "8" and "16" positions of the measures switch.
nput (Pin 13) receives a +14 volt reset pulse
he rhythm unit starts sounding.

of the measures switch is connected
to the Autovari switch. When the Autovari
on", this signal is connected through the varia-
input (Pin 6) to R16, D1, R17 and pin 3 of I.C. 1.
onents are used to differentiate the various clock
ls and drive the two cascaded dividers (I.C. 1).
outputs, which are designated y^2 (first stage) and
stage), are used to drive the variation decoding
ide the 075-000430 rhythm I.C. and the "2 input and"
hich drive the four variation lamps. The "and"
variation A is comprised of D10, D11, R29 and Q8.
and D13 are used to bias the emitters of Q5-Q8
mately +1.6 volts. This bias is needed because
ble high "0" level at the output of the I.C.
d Y3 are both at a "1" level, D10 and D11 will
biased and R29 will supply base current to Q8 which

FIGURE 3-29
AUTO VARI - 64 RHYTHM
THEORY OF OPERATION
(SHEET 1 OF 1)


AUTO-VARI VOICING P.W.B. 124-000380
NOTES:
1. ALL SWITCHES IN OFF POSITION.
2. DENOTES RHYTHM CHASSIS PLUG AND PIN NO.
L KEYING INPUT
KEYING INPUT
0V
-26V
TYPICAL VOICE OUTPUT
31 MS AT FAST RATE
+13V
0V
ON PEDAL
CYMBAL
BASS DRUM
ON LOWER
BRUSH
SNARE DRUM
TO J1-2
+14V
Q15
PEDAL TRIGGER
L M TRIGGER
Q16
D19 OR D20
+13V
12 MS
TOUCH START SIGNAL
VOLUME CONTROL
LOW FREQ OUT
20K
LOW FREQUENCY OUTPUT
SEE SCHEMATIC DIAGRAM DWG. FOR VOICING WAVE FORMS
+19V
L.F. AMP
Q18, Q19
R127
HIGH FREQ. AMP
Q17
R121
HI FREQ OUT
HIGH FREQUENCY OUTPUT
WHITE NOISE GENERATOR
R79
Q9, Q10
200 MV P-P
+14 V
I 14V ZENER
D21
+25 V
GND
: TO PATTERN GEN. P.W.B. 124-000379, J1-8 & VARIATION P.W.B. 124-000418, J4-3. (124-000384 IN EARLY MODELS)
BASS DRUM Q1
CONGA Q2
BONGO Q3
CLAVES Q4
COWBELL #1 Q6
COWBELL #2 Q7
RIM SHOT Q5
SNARE DRUM Q8
CYMBAL
MARACAS
TIME CONSTANT
SNARE Q11
SAND BLOCK Q13
R102
CYMBAL Q14
R88
BRUSH Q12
R97
19 MS
33 MS
DRUM ROLL
AUTO-VARI CLOCK SELECTOR (MEASURES)
AUTO-VARI SWITCH
OFF
ON
RESET
TRIGGER PULSE WITH AUTO-VARI ON
+12V
1MS
10 MS
+23.5V
+2.2V
MEASURE I LED
MEASURE II LED
TEMPO LED
RED
YELLOW
+25V
VARIATION P.W.B. 124-000418
(124-000384 USED IN EARLY PRODUCTION)
Z3
Z2 I.C. #2
F/F #1
F/F #2
Z2
CLOCK IN
VARIATION SWITCHES
AUTO-VARI CLOCK
I.C. #1
Y2
Y3
WITH VARIATION "A" ON, INPUT LEVELS ARE:
Y² (+14V)
Y³ (+14V)
Y² (+0.5V)
Y³ (+0.5V)
Q8
Q7
Q6
Q5
NC
1.6V
RESET TO "A"
+14V
+22V
+23V
15 MS
2 MS
WITH AUTO-ACCOMP ON ONLY

AUTO VARI-64 THEORY OF OPERATION (SHEET 1 OF 2)

1) **GENERAL.**--This section contains the theory of operation, of the Auto Vari Rhythm Units. There are basically two models. The Accessory Model, which is a self contained unit with its own power source, but does require an external amplifier and speaker. This unit does not contain the Auto-Accompaniment feature or the play along voices. Reference to these features should be excluded when using this text for the Accessory Model.

The In-Built Version, which is assembled into and part of the complete organ. The Rhythm Units and functions are identical in the organ models it is used. The control panel and mountings will differ due to cabinet styling and color. The In-Built does contain the Auto-Accompaniment and play along voices.

The Auto Vari has sixteen Rhythm patterns, controlled by 16 interlocking push buttons which can be depressed singularly or in combinations. Two of the buttons select 3/4 time Rhythm patterns, and other fourteen buttons select 4/4 time Rhythm patterns.

2) **PATTERN GENERATOR BOARD - 124-000379**--The 124-000379 Board contains the 075-000430 custom Rhythm IC which is basically the heart of the Auto Vari 64. This IC has a programmable pattern memory, sixteen D.C. controlled pattern inputs, twelve outputs for eleven voices and one Auto-Accompaniment signal. There is a separate gate input which will disable the eleven voice outputs. This gate is not used in this Rhythm unit. There is a clock input which is used to drive the internal decoding circuits. The clock input frequency varies from 4.8 HZ to 30 HZ and drives the 24/18 count address decoder. The five counter stages which make up the address decoder are designated X1 through X5, with only X3, X4 and X5 outputs brought out of the I.C. Divider X5 drives divider Y1 which in turn drives the measure decoder. Divider Y1 feeds Divider Z1 which provides one of switch selectable outputs for driving the variation decoder. When either of the two 3/4 time patterns is activated, the decoding logic automatically changes the address decoder from a 24 count measure to an 18 count measure. There are two variation control inputs which are fed by dividers Y2 and Y3 on the variation board (123-000418). The "430" Rhythm I.C. decodes these inputs into one of four possible variations. The tempo of the Rhythm Unit is controlled by a 500 K potentiometer located on the front panel of the Rhythm Unit. The tempo control is connected to J1-13 and controls the amount of charging current for capacitor C1. The voltage across C1 will increase until it is greater than the voltage at the junction of R5 and R6. Transistor Q1, the programmable unijunction transistor, will then turn on and discharge C1 through resistor R4. This discharge current will turn on transistor Q17, which is used to amplify the output of Q1 for the +14 volt signal required to drive the clock input of the "430" Rhythm I.C.

Transistors Q2 and Q3 from a "Set-Reset" Flip-Flop which stops and starts the Rhythm Generator. The inputs at J1-1 and 2 are "start" inputs and J1-3 is a "stop" input. With either the Silent/Sound rocker or an input from the lower manual or pedal during "Touch-Start Mode", transistor Q2 will turn on and Q3 will turn off. With Q3 off, a +12 volt signal is applied through R17 and R18 to turn off transistor Q4. This "on" signal can be interrupted by the Foot Switch through J1-7 and diode D1 without changing the state of Q2 or Q3. When Q4 turns on, a "Ground" signal is applied to a common bus connecting all normally open rhythm pattern switches together. Therefore, with a rhythm switch depressed, a "ground" signal will be applied to one of the I.C. pattern inputs and "enable" the rhythm generator. Transistor Q3 also couples a positive signal through C2, R21 and Q6. Transistor Q6 turns "on" and provides a reset pulse to pin 20 of the rhythm I.C. This reset pulse is inverted by transistor Q5 and used to reset the Y2-Y3 dividers and the variation dividers Z2-Z3 on the variation dividers board (124-000418). The reset pulse from Q6 is also coupled through C3, R38 and D6 and (during Auto-Accompaniment Mode only) for the first low bass note each time the rhythm was started.

Transistors Q7 through Q10 provide the "ground" signals for the automatic switching of the organ from Auto-Accompaniment mode to "organ" mode when the Auto-Accompaniment switch is on.

Transistor Q9 is normally supplied a +14 volt signal through R25, R26 and R30. Transistor Q9 provides the low impedance necessary to turn on Q10 through the current limiting resistor R31. Transistor Q10 will "ground" all negative signals applied to J1-10 from the organ. When the Foot Switch (located on the organ swell pedal) is activated, a ground is applied to J1-7 and connected to the junction of R26, R30 and Diode D1. This "ground" removes the +14 volt signal normally applied to Q9, thereby turning off transistor Q9 and Q10. Transistor Q7 will now turn on and supply current through R28 to Q8. Transistor Q8 will now "ground" all negative signals applied to J1-11. Transistors Q8 and Q10 can "sink" up to 8ma. from a negative voltage source.

Transistor Q16 is a pulse inverter for the automatic accompaniment signals. Capacitor C11 and resistor R69 form the differentiation network for the negative accompaniment output pulses. Diode D13 shunts the negative accompaniment signal to ground through J1-15 and the Auto-Accompaniment switch when Auto-Accompaniment is off.

The high and low bass output signals are formed by transistors Q12 and Q11 respectively. The input to transistor Q11 is the X5 square wave output from the "430" I.C. This output is routed through the normally closed contacts of the Waltz and 6/8 March rhythm pattern switches to the base of Q11. The output of Q11 is differentiated by C4 and R36, with the negative pulse passing through D3 (with Auto-Accompaniment on) to the low bass output. The frequency of X5 is one cycle per measure, thereby causing Q11 to generate a negative pulse at the beginning of each measure. Transistor Q12 inverts the output of Q11 and generates a negative pulse (through C5, R41, R42 and D10) during the middle of each measure. If either 3/4 time rhythm button is depressed, the X5 input to Q11 will be disconnected and Q11 will be connected to the Y1 divider output. The Y1 divider output (1/2 cycle per measure) will cause the low bass note to sound at the beginning of measure 1 and the high bass note to sound at the beginning of measure 2. The high bass, low bass, and accompaniment organ signals are shunted to ground through diodes D13, D4, D5 and D11 when the Auto-Accompaniment switch is "off".

Transistors Q13 and Q14 form an astable multi-vibrator with a frequency of approximately 20 HZ. This astable is turned on whenever the Rhythm I.C. supplies a +14 volt drum roll signal from I.C. pin #38. The output of the astable is amplified by transistor Q15 which supplies a low impedance (2,200-ohm) signal to the snare drum output through diode D9.

The ten voice outputs (J2-3 through J2-12) are connected directly to the I.C. voice output pins. These outputs provide low impedance (2,000-ohm) positive-going drive pulses which are wired directly to the voicing circuits on the 124-000380 voicing board.

3) **VARIATION BOARD - 124-000418**--The Variation Board provides the following circuits:
   A) Two cascaded dividers which provide the "8" and "16" measure signals for the Autovari measures switch, Z1,Z2.
   B) A four-station lighted pushbutton switch assembly with associated I.C. divider, decoding circuits and variation switch lamp amplifiers.
   C) Transistor lamp amplifier for Tempo, Measure I and Measure II.

A CMOS "Dual D" divider package (I.C. 2) is used to provide the "8" and "16" measure signals for the automatic variation mode. The first divider input, Z1-Pin 12, is connected directly to the Z1 output of the Pattern Generator Board. The first divider output (Z2) is one half the frequency of the input and Z3 is one fourth the frequency of the input. The outputs are +14 volts square waves which are wired directly to the "8" and "16" positions of the measures switch. The reset input (Pin 13) receives a +14 volt reset pulse each time the rhythm unit starts sounding.

The output of the measures switch is connected to the Autovari switch. When the Autovari switch is "on", this signal is connected through the variation clock input (Pin 6) to R16, D1, R17 and pin 3 of I.C. 1. These components are used to differentiate the various clock input signals and drive the two cascaded dividers (I.C. 1). The divider outputs, which are designated y^2 (first stage) and y^3 (second stage), are used to drive the variation decoding circuit inside the 075-000430 rhythm I.C. and the "2 input and" circuits which drive the four variation lamps. The "and" circuit for variation A is comprised of D10, D11, R29 and Q8. Diodes D12 and D13 are used to bias the emitters of Q5-Q8 at approximately +1.6 volts. This bias is needed because of a possible high "0" level at the output of the I.C. When Y2 and Y3 are both at a "1" level, D10 and D11 will be reverse biased and R29 will supply base current to Q8 which

FIGURE 3-29
AUTO VARI - 64 RHYTHM
THEORY OF OPERATION
(SHEET 1 OF 1)

OPERATION (SHEET 2 OF 2)

ısed to generate all low fre-
s. These oscillators are
ulse which provides bias to
R-C time constant at the input
nines the length of time the

ator circuit is the Bass Drum
ng pulse is applied to Pin
nd R3. Diode D1 allows
e capacitor C2. Capacitor
the oscillator time constant
y on Bass Drum and Conga
rt of the input pulse dir-
auses transistor Q1 to be
rt time. This condition
tone when the bass drum
R8 provide a small amount of
r to give the voice envel-
4, C5 and C6 and resistors
y of the oscillator. Resis-
llector current when the oscil-
0 controls the amount of bass
requency preamplifier.
y oscillators have capaci-
evel resistor (such as C12
or is used to remove some
e voice output.

transistor Q9 by reverse bias-
to a zener region. The
77. The white noise output
the base of a common emitter
e output is controlled by
ed for a nominal peak-to-peak
output of the white noise
ur white noise gates through
n networks.

he Snare Drum is also used
ive Snare Drum input applied
and D11 to charge up cap-
ough R73 and the base of
"on", white noise coupled to
s amplified by Q11. Cap-
e noise frequency spectrum
tput level. The Rim Shot
h C25, D9, and R72 to the

is similar to the Snare
output frequency spectrum
tank circuit (L2 and C61).
rcuit is controlled by

d voice and does not have
er white noise voices do.

The input pulses are coupled directly to Q13 through R99, R101, and D14. The output frequency spectrum is shaped by C51 and C52. The output level is set by potentiometer R102.

The Cymbal and Maracas voices share the same white noise gate, but each voice has its own separate time constant circuit.

The Cymbal has a dual slope time constant with the initial attack controlled by C65 and R107, while the rest of the time constant is controlled by C54 and R104. Both Cymbal and Maracas time constants are connected directly to the base of Q14, the white noise gate. The output of Q14 is shaped by LI and C55, and 8 K HZ tank circuit. The output level of the Cymbal/Maracas white noise gate is controlled by R88.

Transistors Q18 and Q19 are used for the low frequency preamplifier, which amplifies the outputs of all phase shift oscillator voicing circuits. Potentiometer R127 is used to adjust the gain of the low frequency output channel.

Transistor Q17 is the high frequency (white noise) preamplifier. The output level of the preamp is controlled by potentiometer R121.

Transistors Q15 and Q16 form the two pulse inverters needed to convert -27 volt organ signals to +14 volt pulses for keying the "Play-Along" voices. Pedal signals are applied to Pin 21 and converted to +14 volt signals by Q15. The output of Q15 passes through R114 to two operator selectable switches; Bass Drum on Pedals and Cymbal on Pedals. The outputs of these switches connect to Pins 11 and 3 respectively on the Voicing Board. Transistor Q16 operates in an identical manner for lower manual signals. Diodes D19 and D20 couple lower manual and pedal trigger pulses to the Touch Start circuit on the Pattern Generator Board - 124-000379.

The +14 volts used to operate all Autovari circuits is supplied by R131 and a $\pm$5%, 14-volt zener diode D21. Capacitor C76 is used to slow down the initial "turn-on" of the supply voltage and help in absorbing power supply spikes generated by various Autovari circuits. Resistor R129 and capacitor C75 are used to decouple the preamp power supply from the main +25 volt power supply input.

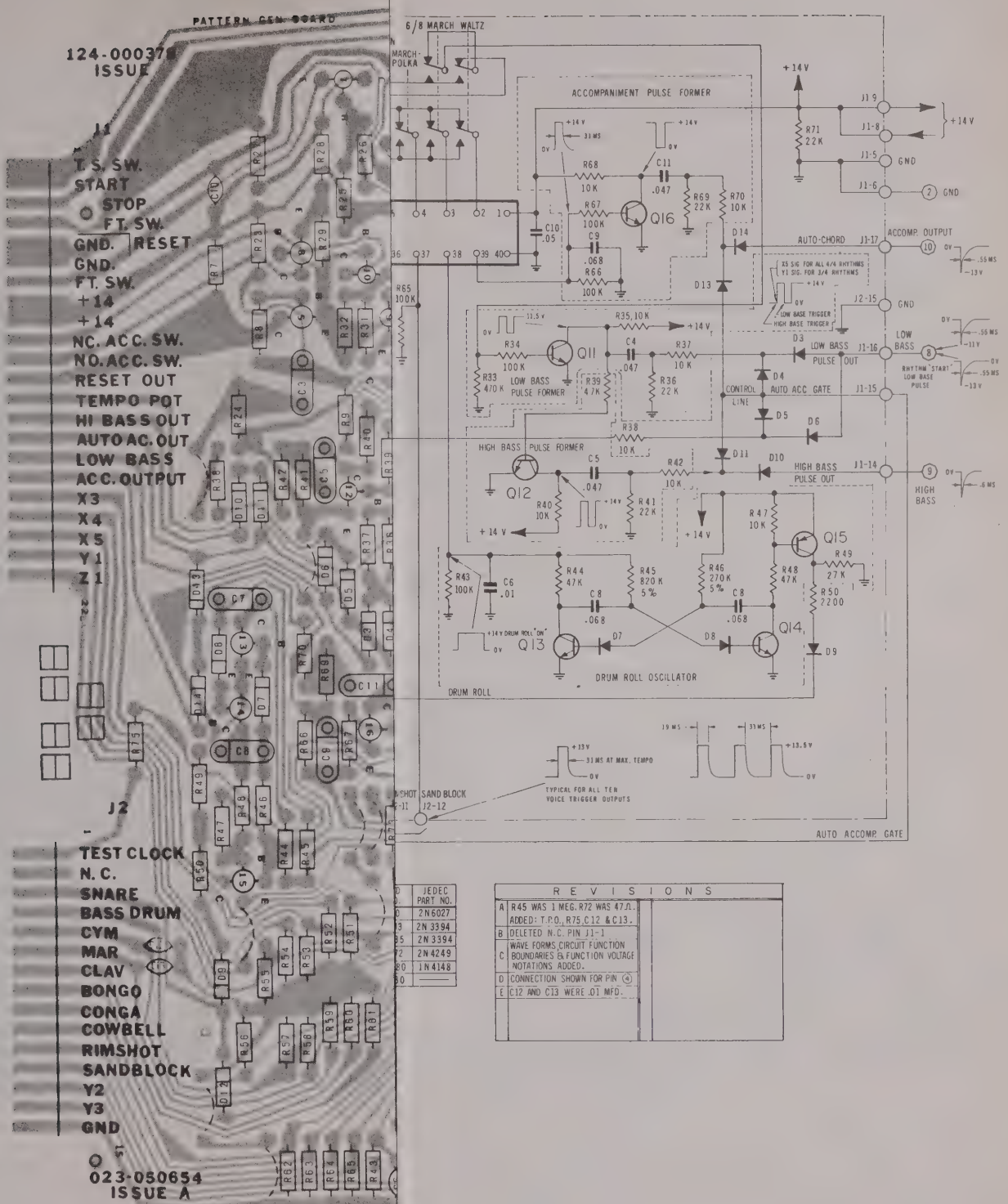


FIGURE 3-31
PATTERN GENERATOR BOARD
SCHEMATIC AND LAYOUT
(124-000379)

AUTO VARI-64 THEORY OF OPERATION (SHEET 2 OF 2)

will then turn on and light variation lamp A.

The reset input (pin 8) receives a +14 volt reset pulse when the Autovari switch is ON and the rhythm unit is switched from SILENT to SOUND. This reset pulse sets both Y2 and Y3 dividers to the "1" state through diodes D2 and D3. This "1" state programs the "430" I.C. for variation "A". The variation clock will then cause the variation to change in a A-B-C-D-A sequence.

The tempo lamp is driven by an amplifier comprised of transistors Q1 and Q2. The input clock is provided by the X^3 divider in the rhythm I.C. This clock is differentiated by C1 and R7 and provides an "ON" time of approximately 15 milliseconds.

The Y^1 divider output from the rhythm I.C. is used to drive transistor Q4, the measure I lamp amplifier. An output from the measure I circuit, located at the junction of R13, Pin 22 and the anode of the measure I L.E.D., is used to drive transistor Q3, the measure II lamp amplifier. When measure I lamp is "ON", transistor Q3 and the measure II lamp will be OFF. When measure I lamp is OFF, transistor Q3 will receive input drive current from R12 and turn "ON", lighting the measure II lamp.

4) VOICING BOARD - 124-000380--The Autovari voicing board contains eleven voices, ten of which are used for the automatic rhythm and one (brush) is only for external keying (lower manual). There are also three prime inputs such as Bass Drum (Pin 11), Snare Drum (Pin 16), and Cymbal (Pin 3), which also are only used for external keying purposes.

There are six basic circuits on this PWB which are listed:

A) Phase Shift Oscillator - There are eight phase shift oscillators which are used for the following voices: Bass Drum (1), Conga (1), Bongo (1), Claves (1), Rim Shot (1), Cowbell (2), and Snare Drum (1).

B) White Noise Generator - There is a white noise generator which supplies all the white noise gates with a broad band white noise signal.

C) White Noise Gate - There are four white noise gates which are used for the following voices: Snare Drum Rim Shot (1), Brush (1), Sand Block (1), Cymbal and Maracas (1).

D) Preamplifiers - There are two preamplifiers used to collect and amplify rhythm output signals. One preamp is used for all low frequency voices (phase shift oscillators) while the other is used for all white noise voices.

E) Pulse Inverters - There are two pulse inverter circuits which convert negative organ pulses to positive pulses for voice triggers. One circuit is used for pedal pulses while the other is used for lower manual pulses.

F) Power Supply - There is a +14 volt zener diode which supplies all unit rhythm boards with a stable supply voltage.

FIGURE 3-30
AUTO VARI - 64 RHYTHM
HEORY OF OPERATION
(SHEET 2 OF 2)

The phase shift oscillators are used to generate all low frequency (60 HZ to 2,500 HZ) voices. These oscillators are turned on by a positive keying pulse which provides bias to the oscillator transistors. An R-C time constant at the input of each oscillator circuit determines the length of time the oscillator is on.

An example of phase shift oscillator circuit is the Bass Drum voicing circuit. The input keying pulse is applied to Pin 12 and is differentiated by C1 and R3. Diode D1 allows only the positive pulse to charge capacitor C2. Capacitor C2 and resistors R6 and R8 form the oscillator time constant circuit. Capacitor C3 (used only on Bass Drum and Conga circuits) is used to couple a part of the input pulse directly to the base of Q1, which causes transistor Q1 to be driven into saturation for a short time. This condition creates the "thump" or "strike" tone when the bass drum first sounds. Resistors R1 and R8 provide a small amount of forward bias (.42 volts) in order to give the voice envelope a long "tail". Capacitors C4, C5 and C6 and resistors R4 and R5 determine the frequency of the oscillator. Resistors R2 and R9 determine the collector current when the oscillator is turned on. Resistor R10 controls the amount of bass drum signal applied to the low frequency preamplifier. Note that all other low frequency oscillators have capacitors in series with the output level resistor (such as C12 for Conga). This series capacitor is used to remove some low frequency components from the voice output.

The white noise is generated by transistor Q9 by reverse biasing the emitter-base junction into a zener region. The zener current is controlled by R77. The white noise output passes through capacitor C45 to the base of a common emitter amplifier (Q10). The white noise output is controlled by potentiometer R79, and is adjusted for a nominal peak-to-peak reading of 200 millivolts. The output of the white noise potentiometer is connected to four white noise gates through four capacitor/resistor isolation networks.

The white noise gate (Q11) for the Snare Drum is also used for the Rim Shop voice. A positive Snare Drum input applied to Pin 15 is coupled through C58 and D11 to charge up capacitor C44, which discharges through R73 and the base of transistor Q11. With Q11 turned "on", white noise coupled to the base of Q11 by R81 and C48 is amplified by Q11. Capacitor C46 and C47 shape the white noise frequency spectrum and resistor R76 controls the output level. The Rim Shot input (Pin 13) is coupled through C25, D9, and R72 to the white noise gate.

The Brush white noise gate (Q12) is similar to the Snare Drum noise gate except that the output frequency spectrum is shaped by a 12 K HZ resonant tank circuit (L2 and C61). The output level of the Brush circuit is controlled by potentiometer R97.

The Sand Block is a DC-controlled voice and does not have a percussive envelope as the other white noise voices do.

The input pulses are coupled directly to Q13 through R99, R101, and D14. The output frequency spectrum is shaped by C51 and C52. The output level is set by potentiometer R102.

The Cymbal and Maracas voices share the same white noise gate, but each voice has its own separate time constant circuit.

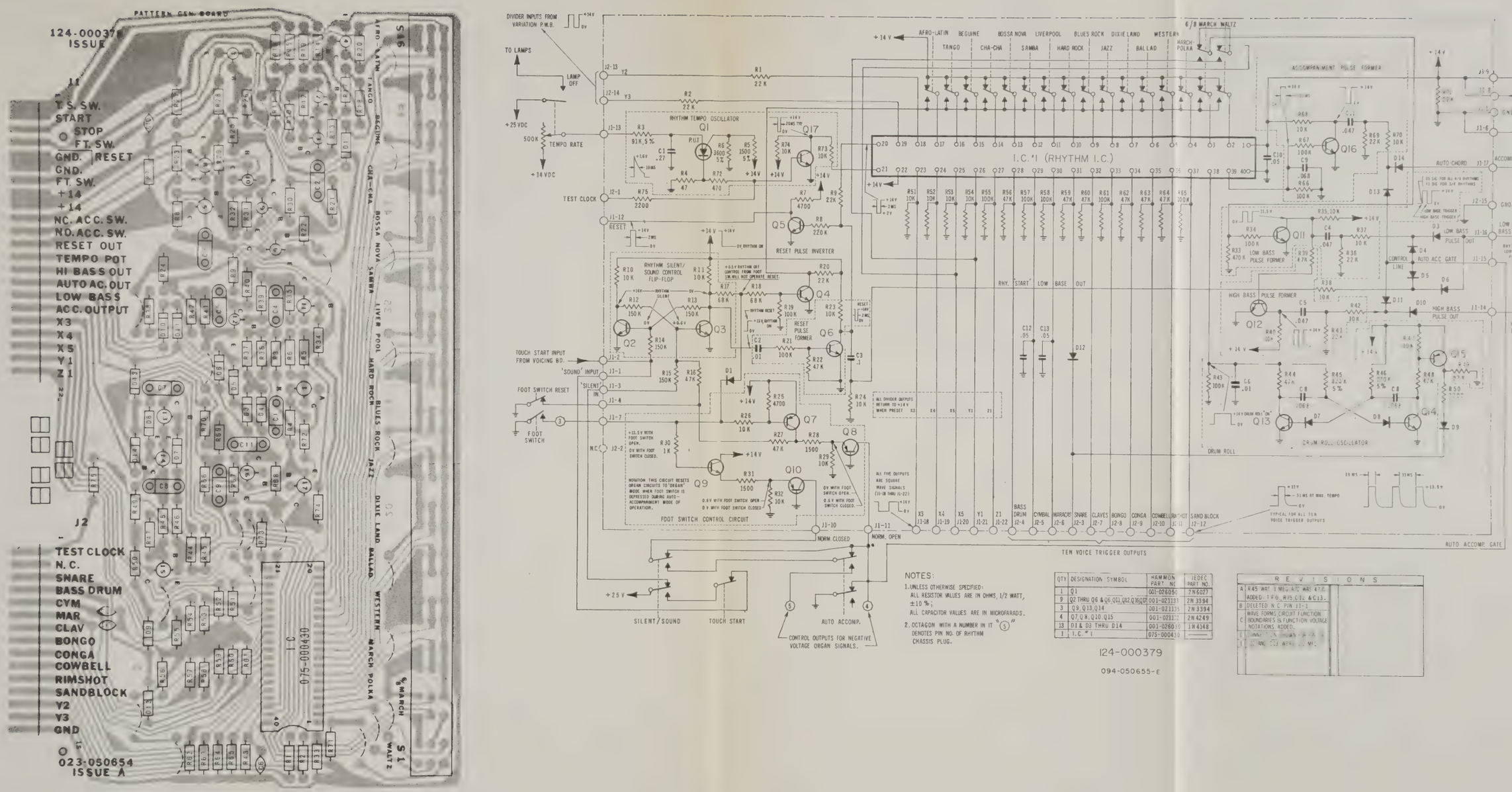
The Cymbal has a dual slope time constant with the initial attack controlled by C65 and R107, while the rest of the time constant is controlled by C54 and R104. Both Cymbal and Maracas time constants are connected directly to the base of Q14, the white noise gate. The output of Q14 is shaped by L1 and C55, and 8 K HZ tank circuit. The output level of the Cymbal/Maracas white noise gate is controlled by R88.

Transistors Q18 and Q19 are used for the low frequency preamplifier, which amplifies the outputs of all phase shift oscillator voicing circuits. Potentiometer R127 is used to adjust the gain of the low frequency output channel.

Transistor Q17 is the high frequency (white noise) preamplifier. The output level of the preamp is controlled by potentiometer R121.

Transistors Q15 and Q16 form the two pulse inverters needed to convert -27 volt organ signals to +14 volt pulses for keying the "Play-Along" voices. Pedal signals are applied to Pin 21 and converted to +14 volt signals by Q15. The output of Q15 passes through R114 to two operator selectable switches; Bass Drum on Pedals and Cymbal on Pedals. The outputs of these switches connect to Pins 11 and 3 respectively on the Voicing Board. Transistor Q16 operates in an identical manner for lower manual signals. Diodes D19 and D20 couple lower manual and pedal trigger pulses to the Touch Start circuit on the Pattern Generator Board - 124-000379.

The +14 volts used to operate all Autovari circuits is supplied by R131 and a $\pm 5\%$, 14-volt zener diode D21. Capacitor C76 is used to slow down the initial "turn-on" of the supply voltage and help in absorbing power supply spikes generated by various Autovari circuits. Resistor R129 and capacitor C75 are used to decouple the preamp power supply from the main +25 volt power supply input.



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10 %;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. OCTAGON WITH A NUMBER IN IT "⑤" DENOTES PIN NO. OF RHYTHM CHASSIS PLUG.

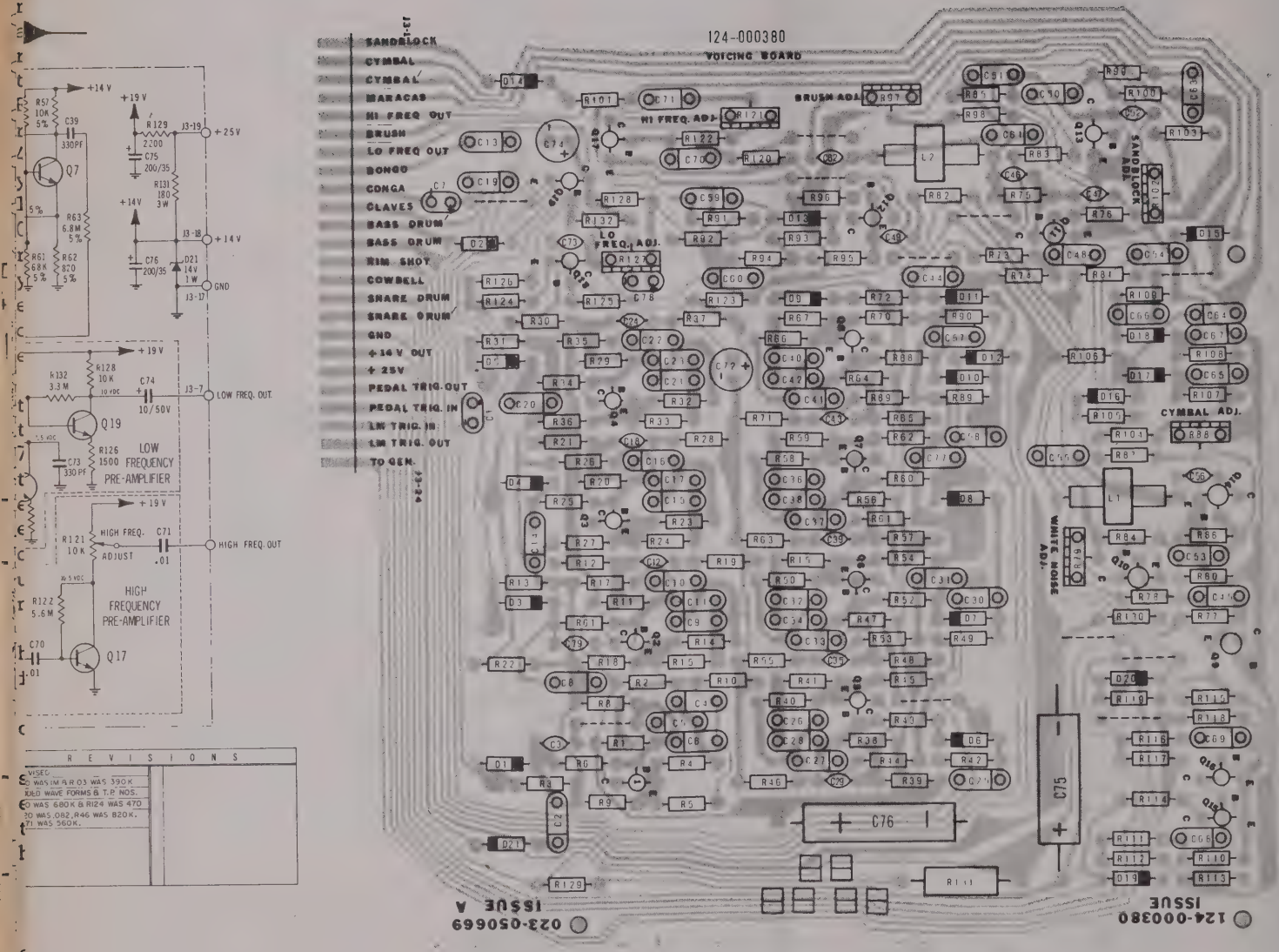
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
1	Q1	001-026050	2N6027
9	Q2 THRU Q6 & Q6,Q11,Q12,Q16,Q17	001-023133	2N3394
3	Q9,Q13,Q14	001-023135	2N3394
4	Q7,Q8,Q10,Q15	001-023127	2N4249
13	D1 & D3 THRU D14	001-026010	1N4148
1	I.C. #1	075-000430	——

124-000379

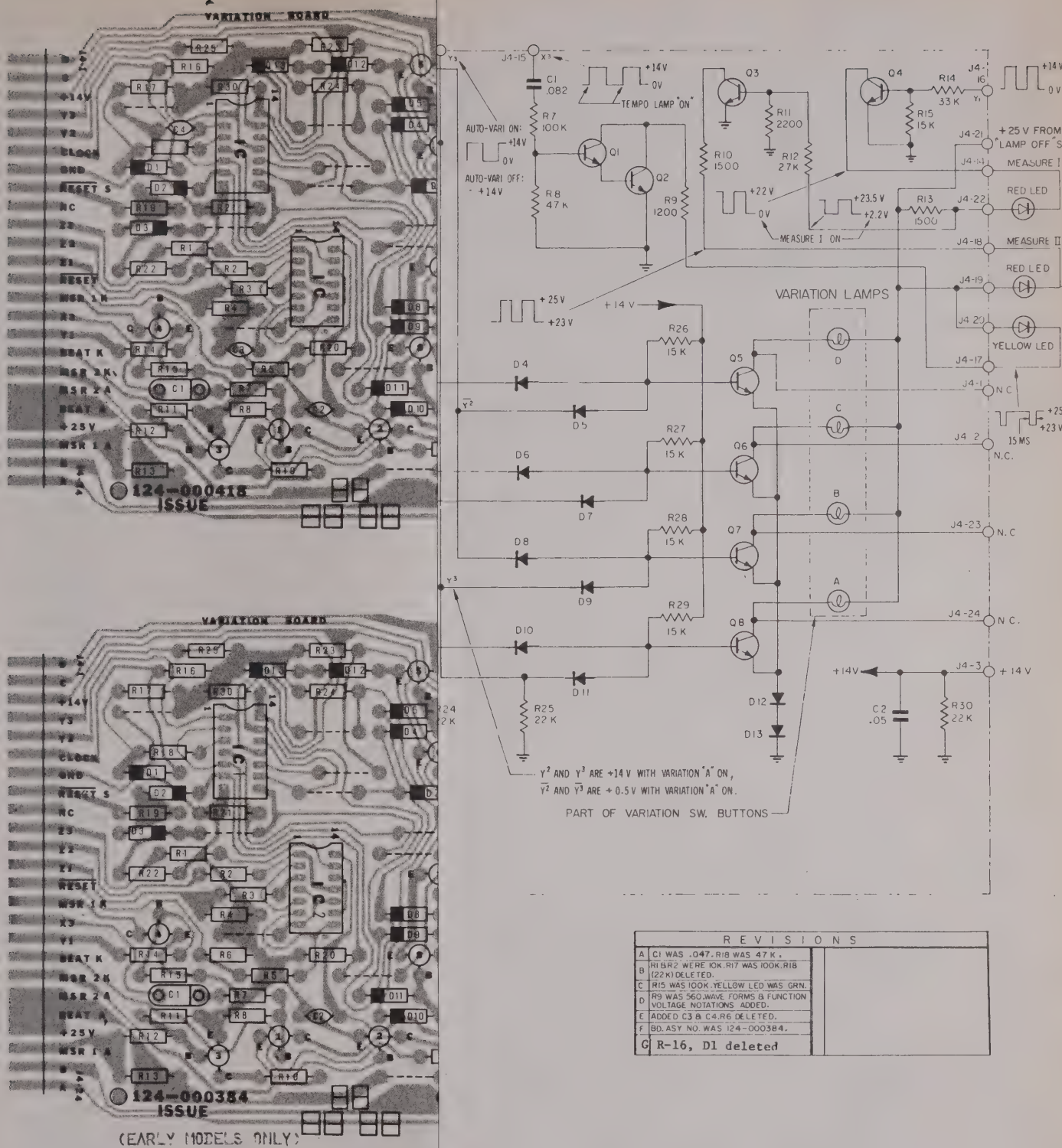
094-050655-E

REVISIONS			
A	R45 WAS 1 MEG, R75 WAS 470. ADDED: TP0, R75,C12, & C13.		
B	DELETED N.C. PIN J1-1.		
C	WAVE FORMS, CIRCUIT FUNCTION BOUNDARIES & FUNCTION VOLTAGE NOTATIONS ADDED.		
[illegible]	[illegible]		

FIGURE 3-31
PATTERN GENERATOR BOARD
SCHEMATIC AND LAYOUT
(124-000379)

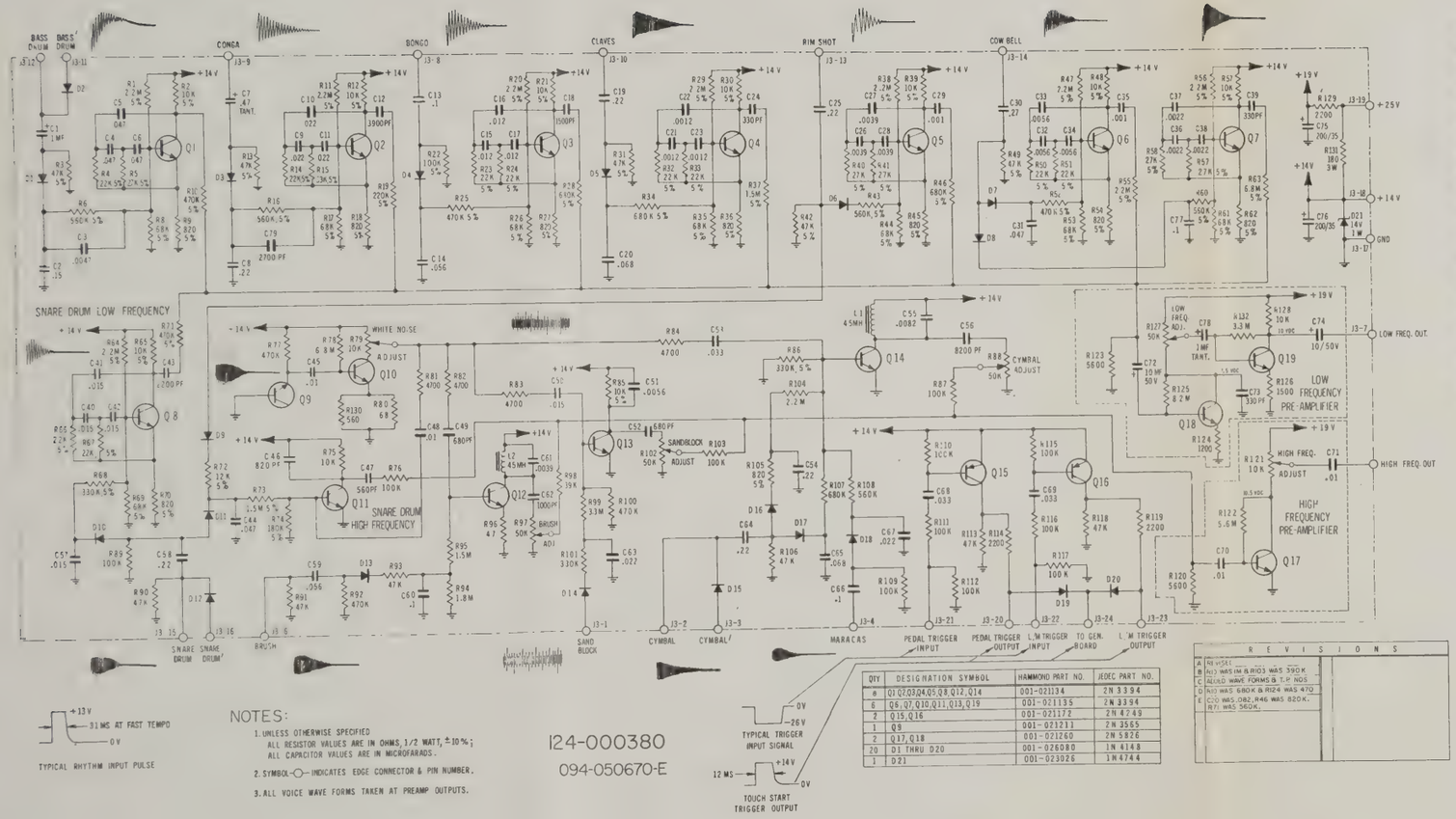


REVISIONS	
VISED. O WAS 3M & R 03 WAS 390K. OLD WAVE FORMS & T.P. NOS. O WAS 680K & R124 WAS 470 O WAS .082, R46 WAS 820K. 71 WAS 560K.	



REVISIONS		
A	C1 WAS .047. R18 WAS 47K.	
B	R18 R2 WERE 10K. R17 WAS 100K. R18 (22K) DELETED.	
C	R15 WAS 100K. YELLOW LED WAS GRN.	
D	R9 WAS 560. WAVE FORMS & FUNCTION VOLTAGE NOTATIONS ADDED.	
E	ADDED C3 & C4. R6 DELETED.	
F	BD. ASY NO. WAS 124-000384.	
G	R-16, D1 deleted	

FIGURE 3-33
VARIATION BOARD
SCHEMATIC AND LAYOUT
(124-000418)



NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%; ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL -○- INDICATES EDGE CONNECTOR & PIN NUMBER.
3. ALL VOICE WAVE FORMS TAKEN AT PREAMP OUTPUTS.

124-000380
094-050670-E

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
8	Q1,Q2,Q3,Q4,Q5,Q8,Q12,Q14	001-021134	2N 3394
6	Q6,Q7,Q10,Q11,Q13,Q19	001-021135	2N 3394
2	Q15,Q16	001-021172	2N 4249
1	Q9	001-021211	2N 3565
2	Q17,Q18	001-021260	2N 5826
20	D1 THRU D20	001-026080	1N 4148
1	D21	001-023026	1N 4744

REVISIONS		
A	R1 WAS 1M	
B	R3 WAS 1M & R103 WAS 390K	
C	ALL 40 WAVE FORMS & T.P. NOS.	
D	R3 WAS 680K & R124 WAS 470	
E	C10 WAS .082, R46 WAS 820K. R71 WAS 560K.	

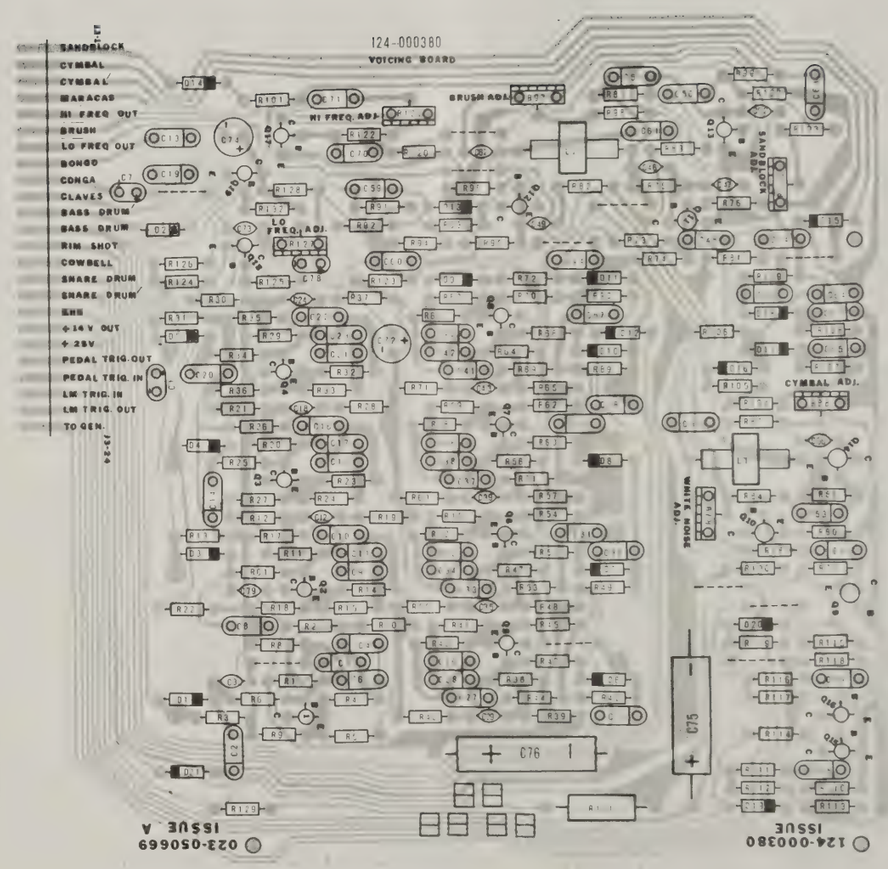
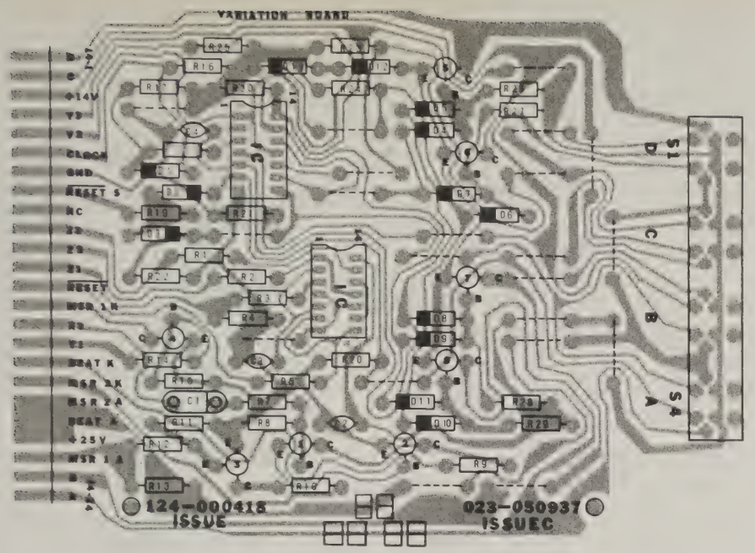
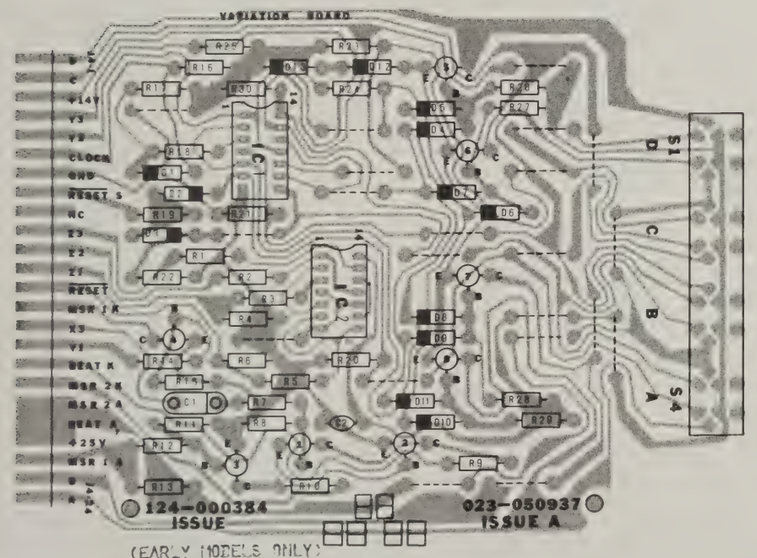
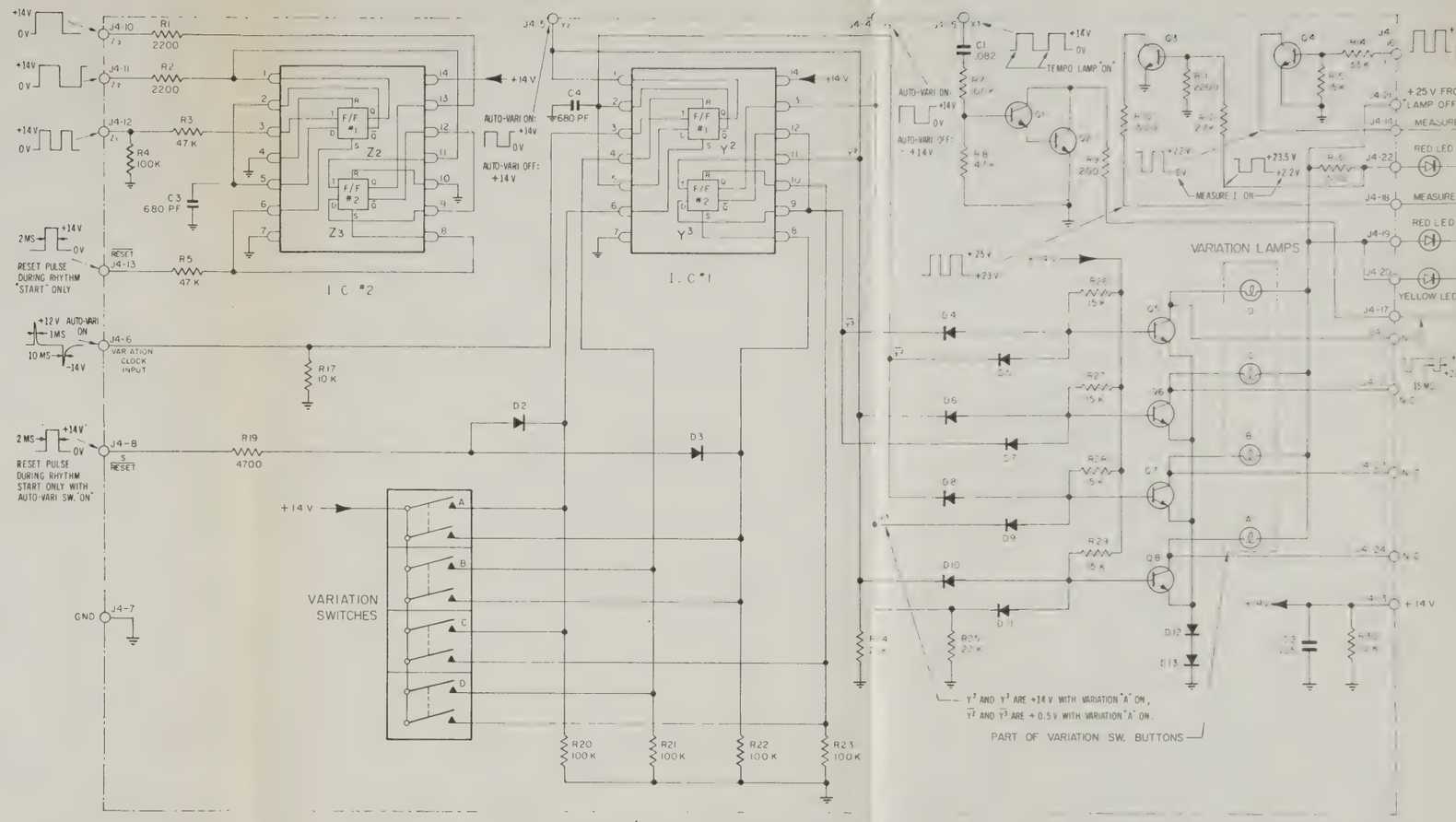


FIGURE -332
RHYTHM VOICING BOARD
SCHEMATIC AND LAYOUT
(124-000380)





(EARLY MODELS ONLY)


I C #2
I. C. #1
VARIATION SWITCHES
VARIATION LAMPS
RESET PULSE DURING RHYTHM "START" ONLY
RESET PULSE DURING RHYTHM START ONLY WITH AUTO-VARI SW. "ON"
VAR ATION CLOCK INPUT
AUTO-VARI ON: +14V 0V
AUTO-VARI OFF: +14V
TEMPO LAMP "ON"
MEASURE I ON
+25 V FROM "LAMP OFF" SW.
MEASURE I
MEASURE II
RED LED
YELLOW LED
Y² AND Y³ ARE +14 V WITH VARIATION "A" ON,
Y² AND Y³ ARE +0.5 V WITH VARIATION "A" ON.
PART OF VARIATION SW. BUTTONS

NOTES:

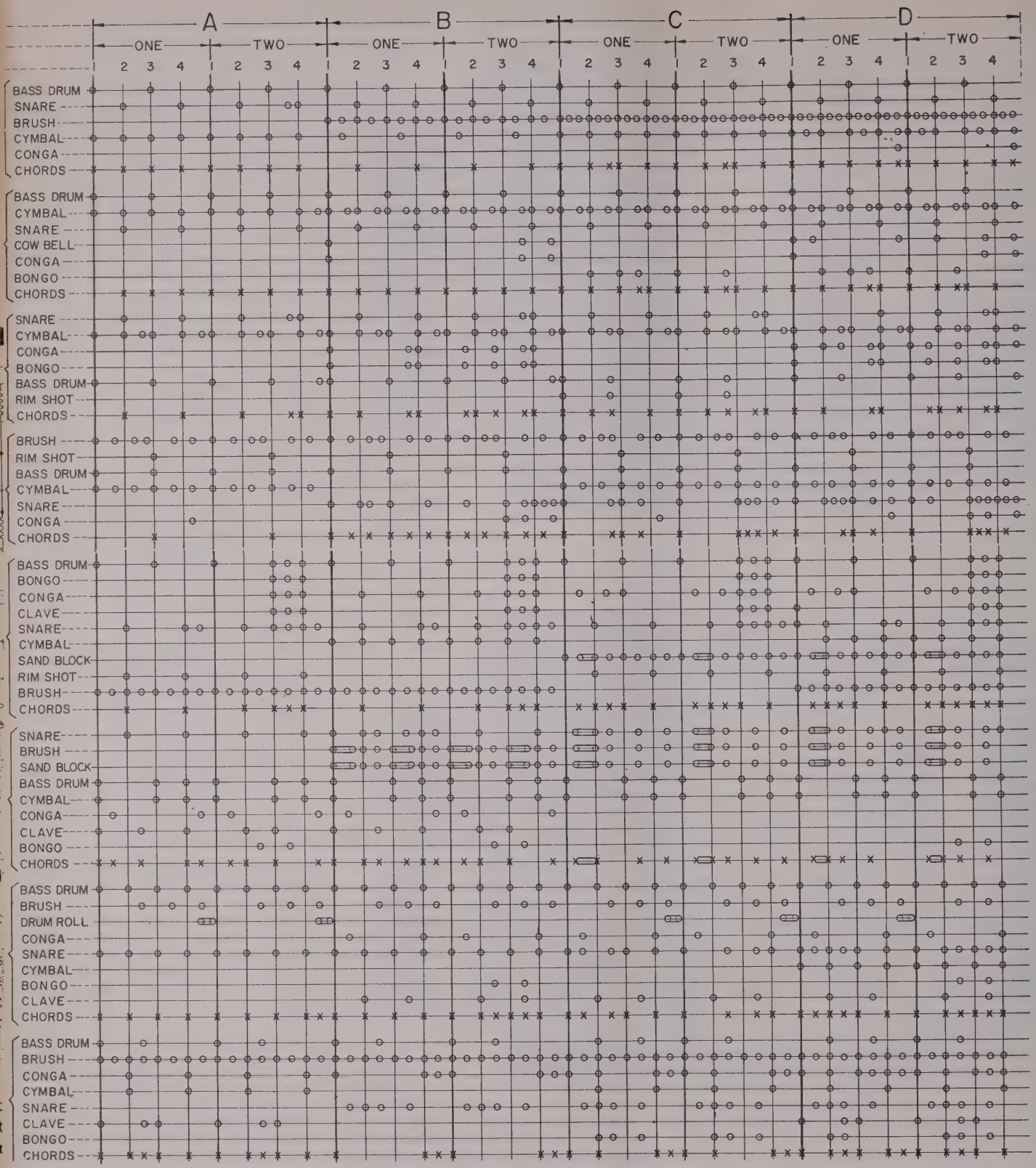
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. LAMPS SHOWN ARE G.E.#85.
3. SYMBOL -○- INDICATES EDGE CONNECTOR PIN NUMBER.

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
8	Q1 THRU Q8	001-021135	2N 3394
13	D1 THRU D13	001-026080	IN 4148
2	I C #1 & I.C.#2	075-000100	———

124-000418
094-050938-F

REVISIONS		
A	C1 WAS .047. R18 WAS 47 K.	
B	R1 & R2 WERE 10K. R17 WAS 100K R18 (22 K) DELETED.	
C	R15 WAS 100K. YELLOW LED WAS GRN.	
D	R9 WAS 560. WAVE FORMS & FUNCTION VOLTAGE NOTATIONS ADDED.	
E	ADDED C3 & C4. R6 DELETED.	
F	BD. ASY. NO. WAS 124-000384.	
G	R-16, D1 deleted	

FIGURE 3-33
VARIATION BOARD
SCHEMATIC AND LAYOUT
(124-000418)



KS AND VARIATION CHART

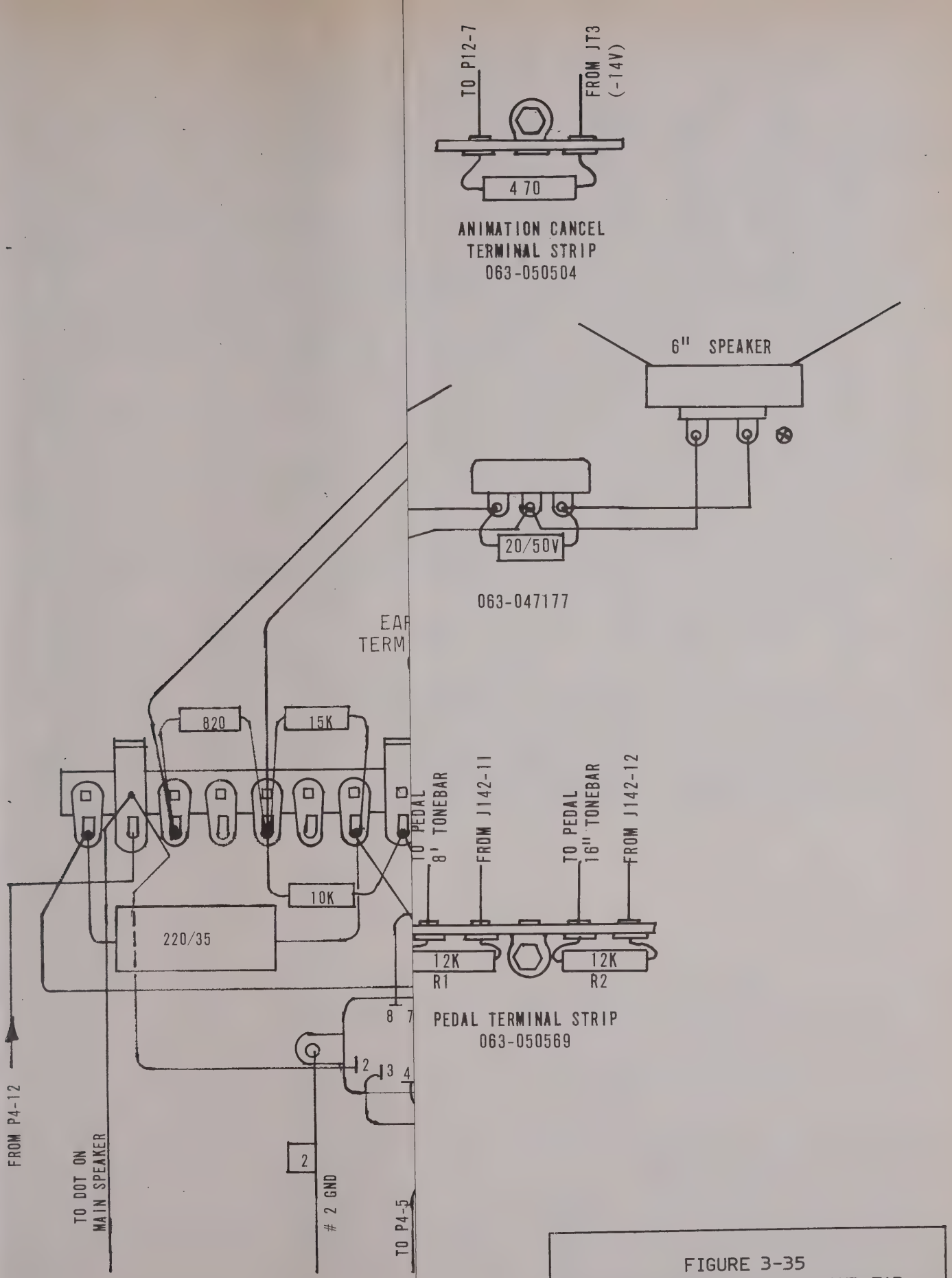
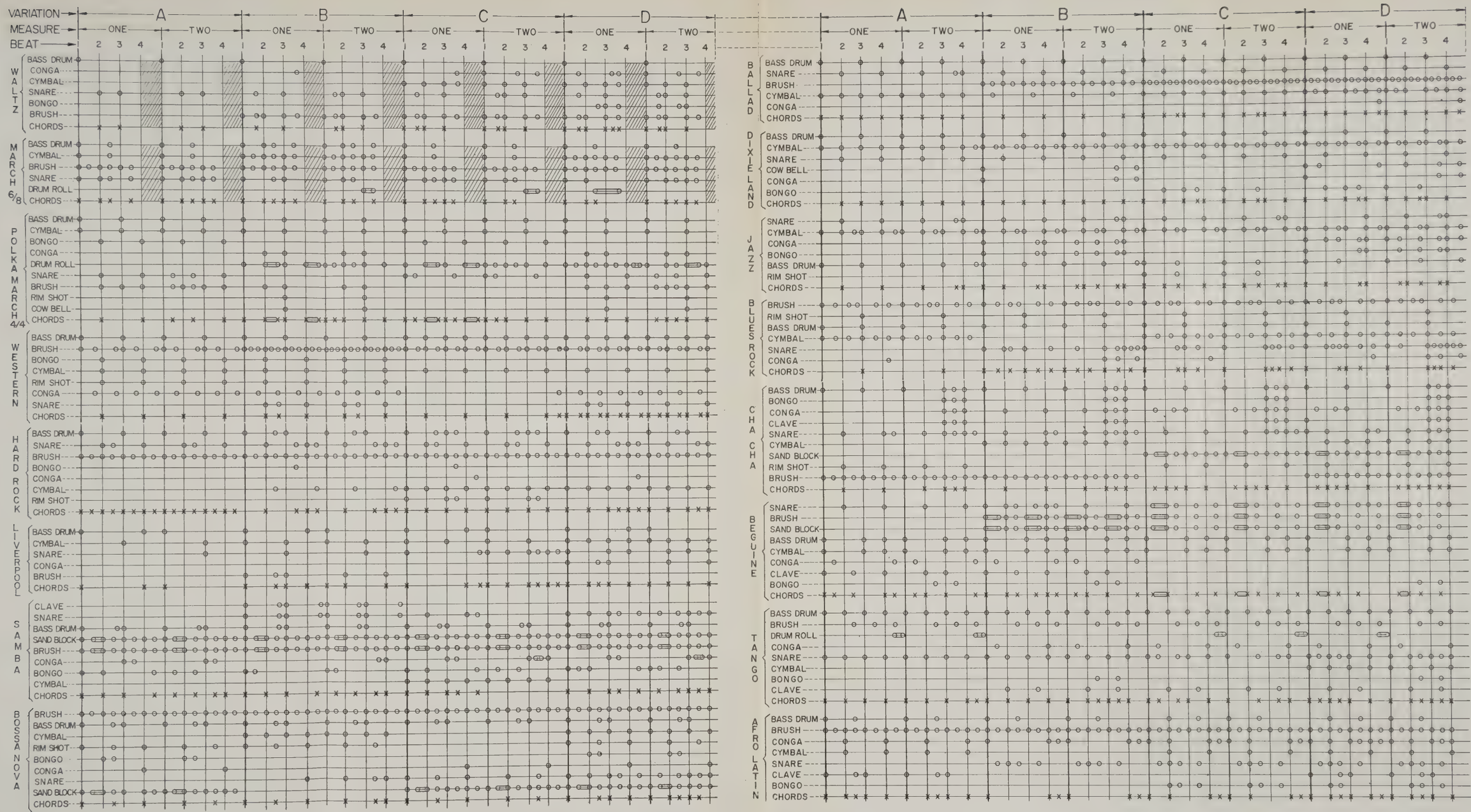
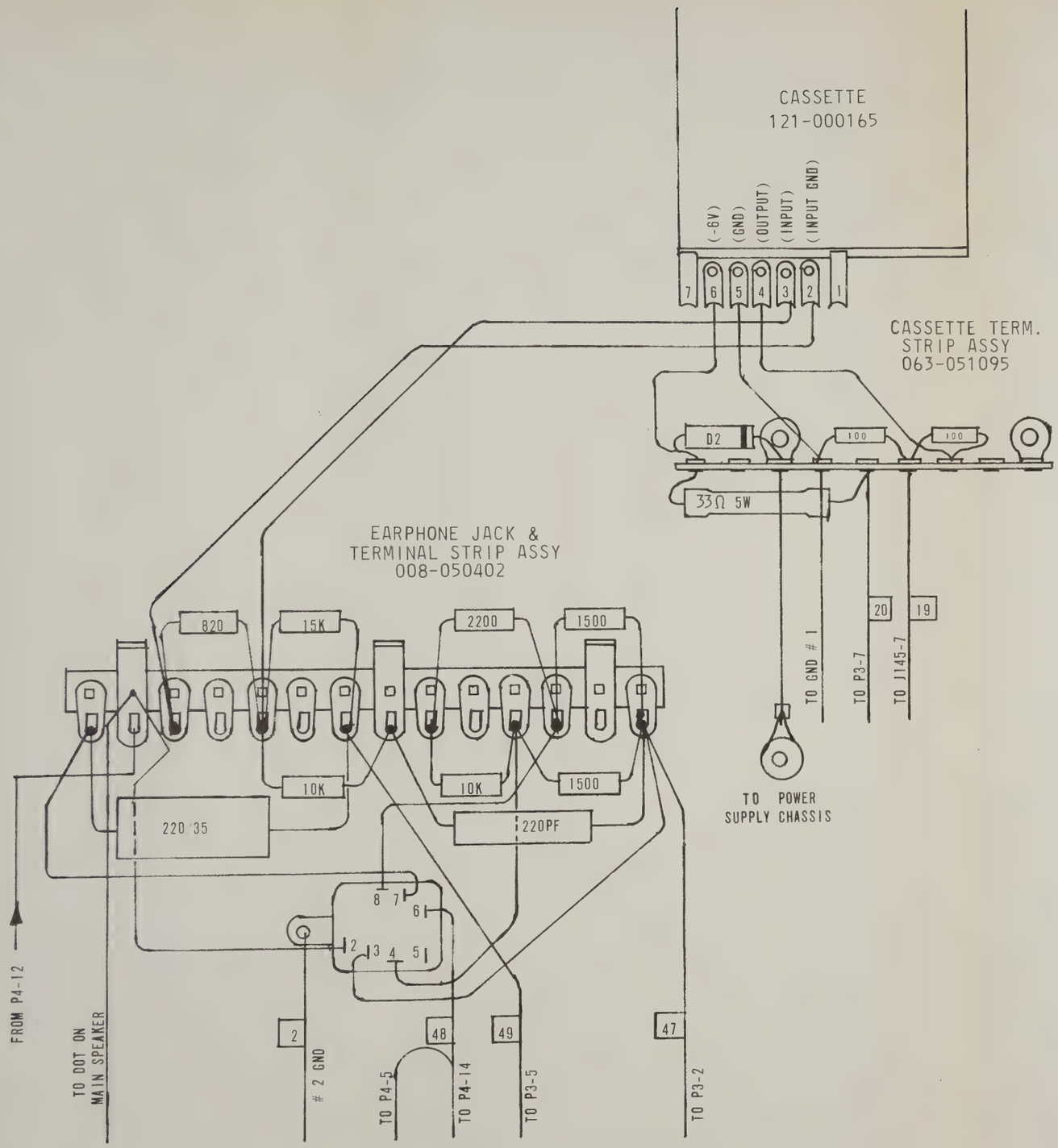


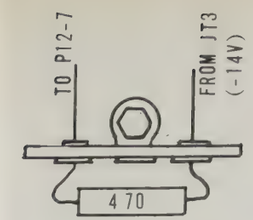
FIGURE 3-35
WIRING DIAGRAMS CASETTE AND EAR-PHONE TERMINAL STRIPS, ANIMATION CANCEL, SPEAKER & PEDAL STRIPS



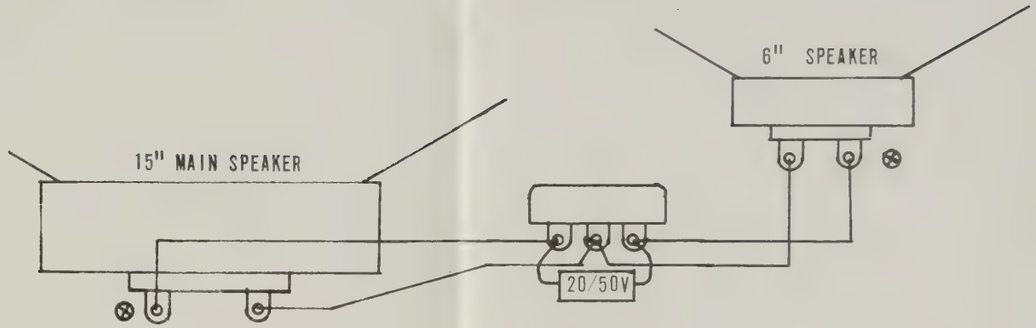
AUTO VARI-64 RHYTHM TRACKS AND VARIATION CHART

FIGURE 3-34
AUTO VARI - 64 RHYTHM
TRACKS AND PATTERNS CHART

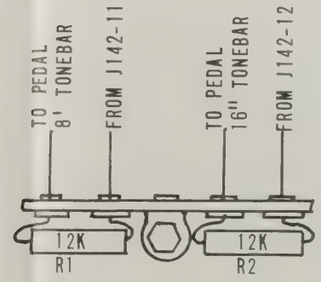




ANIMATION CANCEL
TERMINAL STRIP
063-050504



063-047177



PEDAL TERMINAL STRIP
063-050569

FIGURE 3-35
WIRING DIAGRAMS CASETTE AND EAR-PHONE TERMINAL STRIPS, ANIMATION CANCEL, SPEAKER & PEDAL STRIPS

CONTROL PANEL TAB SWITCH ASSEMBLY WIRING CHART

SWITCH / TERM	REPEAT	PERCUSSION FAST	2	3	5	GLOCK	TWIN MALLET XYLOPHONE	TWIN MALLET MARIMBA	SECOND VOICE	PIZZICATO 1 (OBOE)	PIZZICATO 2 (SAX)
	(S1)	(S2)	(S3)	(S4)	(S5)	(S6)	(S7)	(S8)	(S9)	(S10)	(S11)
1	RED	VIO	BRN(2)	BRN(2)	BRN(2)	NC	BRN(2)	BRN	BRN	ORN	YEL
2	ORN	ORN	WHT/RED	RED	WHT/RED	NC	ORN	RED	RED	VIO	RED
3	BRN(2)	NC	NC	NC	NC	NC	NC	NC	ORN	NC	NC
4	YEL	BLK	NC	NC	NC	BRN(2)	YEL(2)	YEL	YEL	YEL	ORN
5	BLK	GRN	GRN	VIO	GRN	GRN	GRN	WHT/GRN	BLK	CLEAR	VIO
6	VIO	NC	VIO	GRN	VIO	NC	NC	NC	VIO	NC	NC

SWITCH / TERM	BANJO (POST HORN)	HARPSICHORD (VIOLIN)	PIANO (DIAPASON)	PIANO SOLO	SUSTAIN UPPER SHORT	SUSTAIN UPPER LONG	SUSTAIN TO FOOT SWITCH	PEDAL SUSTAIN 1	PEDAL SUSTAIN 2	LOWER TO PEDAL	ACCOUSTIC TREMOLO CELESTE
	(S12)	(S13)	(S14)	(S15)	(S16)	(S17)	(S18)	(S19)	(S20)	(S21)	(S22)
1	YEL	YEL	CLEAR	NC	GRA	GRA(2)	NC	NC	NC	NC	NC
2	CLEAR	CLEAR	CLEAR	GRN	RED(2)	RED	NC	NC	NC	NC	NC
3	NC	NC	NC	ORN	NC	NC	NC	NC	NC	NC	NC
4	NC	NC	NC	YEL	NC	NC	NC	NC	NC	NC	SH-YEL
5	ORN	VIO	ORN	WHT	ORN(2)	VIO	GRN(2)	BLU	GRN	BLK	ORN
6	VIO	ORN	VIO	VIO	VIO	ORN	VIO(2)	ORN	BLU(2)	VIO	CLEAR

SWITCH / TERM	ACCOUSTIC TREMOLO ON LOWER	ACCOUSTIC TREMOLO CELESTE	ACCOUSTIC TREMOLO CHORUS	VIBRATO 1	VIBRATO 2	DELAY VIBRATO	REVERB 1	REVERB 2	ACCOUSTIC TREMOLO ON REVERB	BRILLANCE	VOLUME SOFT
	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33
1	NC	NC	NC	NC	NC	NC	BRN	NC	NC	NC	NC
2	NC	BLK	NC	NC	VIO	NC	ORN	NC	NC	CLEAR	NC
3	NC	WHT	NC	NC	WHT/BLU	NC	NC	NC	NC	WHT/BLK(2)	NC
4	SH-YEL	VIO	YEL	NC	YEL	GRN	NC	ORN(2)	CLEAR	NC	GRN
5	GRN	BLK(2)	CLEAR	GRN	VIO(2)	YEL	WHT/BLK	GRN	GRN(2)	CLEAR	GRA
6	SH-RED	GRN	NC	VIO	GRN	NC	VIO	VIO	VIO	WHT/BLK(2)	NC

REVIATION CODE

n on the
g and
mber
charts
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organ,

L/M - Lower Manual
L.H.- Left Hand
N.C. - No Connection
P - Plug
Pos. - Position
S - Tab Switches
S1 - Arpeggiator Switch
S2 - Arpeggiator Switch
SH - Shield
T/B - Tone Bar
T/S - Terminal Strip
U - Upper
U/M - Upper Manual
UL - Upper Board - Lower Connector (124-000223-002)
Uu - Upper Board - Upper Connector (124-000223-002)

AN

	17	18	19	20	21	22	23	24
UPPER MANUAL BOARD #1 KEYS 1 THRU 22	N. C. N.C.	J-116U-15 J-138-3	J-116U-20 J-138-2	J-116U-10 J-138-1	J-115U-8 J-137-15	J-115U-13 J-137-14	J-114U-9 J-137-13	J-115U-21 J-137-12
UPPER MANUAL BOARD #2 KEYS 23 THRU 44	N.C. N.C.	J-116U-6 J-136-11	J-115U-4 J-136-10	J-116U-16 J-136-9	J-116U-21 J-136-8	J-116U-11 J-136-7	J-115U-9 J-136-6	J-115U-14 J-136-5
UPPER MANUAL BOARD #3 KEYS 45 THRU 61	-114U-12	J-114U-2	J-114U-7	J-115U-19	J-114U-17			
LOWER MANUAL BOARD #1 KEYS 1 THRU 22	N.C.	J-116L-15	J-116L-20	J-116L-10	J-116L-8	J-115L-13	J-114L-9	J-115L-21
LOWER MANUAL BOARD #2 KEYS 23 THRU 44	N.C.	J-116L-6	J-115L-4	J-116L-16	J-116L-21	J-116L-11	J-115L-9	J-115L-14
LOWER MANUAL BOARD #3 KEYS 45 THRU 61	-114L-12	J-114L-2	J-114L-7	J-115L-19	J-114L-17			
TONE CABINET OUTLET								
TO TREMOLO ASSEMBLY								
POWER AMP. ASSY. 126-000108-001								
POWER AMP. ASSY. 126-000108-001								
POWER SWITCH	TOR LOCATIONS 2-25							
MUSIC LITE ASSY.								
RHYTHM ASSY.								
SWELL PEDAL								
PEDAL SWITCH ASSY. PEDALS 13 THRU 25								
PEDAL SWITCH ASSY. PEDAL 1 THRU 12								
CONNECTORS								
CONNECTORS								
CONNECTORS								

FIGURE 3-37
PLUG AND PIN NUMBERS WIRING CHART
(PLUG #1 THRU 27) SEE FIGURE 3-36
FOR ABBREVIATIONS CODE

CONTROL PANEL TAB SWITCH ASSEMBLY WIRING CHART

(POINT TO POINT)

SWITCH TERM	REPEAT	PERCUSSION FAST	2	3	5	GLOCK	TWIN MALLET XYLOPHONE	TWIN MALLET MARIMBA	SECOND VOICE	PIZZICATO 1 (OBOE)	PIZZICATO 2 (SAX)
	(S1)	(S2)	(S3)	(S4)	(S5)	(S6)	(S7)	(S8)	(S9)	(S10)	(S11)
1	J-126-1	P-32-4 S-10-2	J-125-12 S-4-1 J-128-4	S-3-1 S-5-1	S-4-1 S-6-4		S-6-4 S-8-1	S-7-1	S-7-1	S-2-2 S-11-4	S-10-4 S-12-1
2	S-9-3	P-32-5 S-10-1		J-128-3	J-128-9	NC	J-128-10	J-128-8	J-125-8	S-11-5	J-106-13
3	S-9-1 J-143-8	NC	NC	NC	NC	NC	NC	NC	S-1-2	NC	NC
4	J-125-13	S-1-5	NC	NC	NC	S-5-1 S-7-1	J-125-11 S-8-4	S-7-4	J-147-11	J-126-12 S-11-1	S-10-1 S-12-5
5	S-2-4 J.T. #2	S-9-5 J-125-5	S-4-6	S-5-6	J-125-3	J-128-7	J-128-5	J-128-6	S-2-4	J-106-14	S-10-2 S-12-6
6	J-125-14	NC	J-125-4	S-3-5	S-4-5 J-245U-6	NC	NC	NC	J-125-9	NC	NC

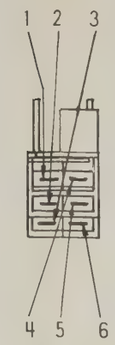
SWITCH TERM	BANJO (POST HORN)	HARPSICHORD (VIOLIN)	PIANO (DIAPASON)	PIANO SOLO	SUSTAIN UPPER SHORT	SUSTAIN UPPER LONG	SUSTAIN TO FOOT SWITCH	PEDAL SUSTAIN 1	PEDAL SUSTAIN 2	LOWER TO PEDAL	ACCOUSTIC TREMOLO CELESTE
	(S12)	(S13)	(S14)	(S15)	(S16)	(S17)	(S18)	(S19)	(S20)	(S21)	(S22)
1	S-11-1 S-13-1	S-12-1	J-106-7	NC	S-17-1	S-16-1 J.T. #3	NC	NC	NC	NC	NC
2	J-106-12	J-106-8	J-126-14	S-18-5	J-147-21 S-17-2	S-16-2	NC	NC	NC	NC	NC
3	NC	NC	NC	S-14-5	NC	NC	NC	NC	NC	NC	NC
4	NC	NC	NC	J-125-15	NC	NC	NC	NC	NC	NC	J-143-12
5	S-11-4 S-13-6	S-14-6	S-15-3	J.T. #6	P-32-2 S-17-6	S-18-6	S-15-2 J-143-14	S-20-6	P-76	J.T. #2 P-54-1	J-143-1
6	S-11-5	S-12-5	S-13-5	P-108	P-32-3	J-16-5	S-17-5 J-143-13	P-33-4	S-19-5 P-54-2		J-143-9

SWITCH TERM	ACCOUSTIC TREMOLO ON LOWER	ACCOUSTIC TREMOLO CELESTE	ACCOUSTIC TREMOLO CHORUS	VIBRATO 1	VIBRATO 2	DELAY VIBRATO	REVERB 1	REVERB 2	ACCOUSTIC TREMOLO ON REVERB	BRILLANCE	VOLUME SOFT
	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33
1	NC	NC	NC	NC	NC	NC	P-43-5	NC	NC	NC	NC
2	NC	S-24-5	NC	NC	S-27-5	NC	S-30-4	NC	NC	P-33-1	NC
3	NC	P-43-13	NC	NC	P-22-3	NC	NC	NC	NC	S-32-6 S-29-5	NC
4	J-143-11	P-43-14	P-43-7	NC	P-22-4	J-147-19	NC	S-29-2 P-43-4	P-43-2 J-257-12	NC	P-43-1 J-257-10
5	P-33-3	S-24-2 J.T. #2	P-43-8	S-27-6	S-27-2 J.T. #1	P-22-2	S-32-3	S-31-5	S-30-5 P-43-3	J-143-4	J.T. #3
6	J-143-10	P-43-6	NC	J-126-6	S-26-5	NC	S-30-6	S-29-6	P-43-9	S-32-3 J.T. #4	NC

FIGURE 3-36
CONTROL PANEL TAB SWITCH WIRING CHART AND CHART ABBREVIATION CODE

CONTROL PANEL TAB SWITCH ASSEMBLY WIRING CHART

SWITCH VIEWED FROM FRONT OF ORGAN WITH CONTROL PANEL IN THE SWING UP POSITION



WITH TAB SWITCH IN THE UP(OFF) POSITION:
IF SWITCH TERMINAL 5 & 6 OR 2 & 3 ARE USED, THE RESULT WILL BE A NORMALLY OPEN SWITCH.

IF SWITCH TERMINAL 5 & 4 OR 2 & 1 ARE USED, THE RESULT WILL BE A NORMALLY CLOSED SWITCH.

SWITCH TERM	REPEAT	PERCUSSION FAST	2	3	5	GLOCK	TWIN MALLET XYLOPHONE	TWIN MALLET MARIMBA	SECOND VOICE	PIZZICATO 1 (OBOE)	PIZZICATO 2 (SAX)
	(S1)	(S2)	(S3)	(S4)	(S5)	(S6)	(S7)	(S8)	(S9)	(S10)	(S11)
1	RED	VIO	BRN(2)	BRN(2)	BRN(2)	NC	BRN(2)	BRN	BRN	ORN	YEL
2	ORN	ORN	WHT/RED	RED	WHT/RED	NC	ORN	RED	RED	VIO	RED
3	BRN(2)	NC	NC	NC	NC	NC	NC	NC	ORN	NC	NC
4	YEL	BLK	NC	NC	NC	BRN(2)	YEL(2)	YEL	YEL	YEL	ORN
5	BLK	GRN	GRN	VIO	GRN	GRN	GRN	WHT GRN	BLK	CLEAR	VIO
6	VIO	NC	VIO	GRN	VIO	NC	NC	NC	VIO	NC	NC

SWITCH TERM	BANJO (POST HORN)	HARPSICHORD (VIOLIN)	PIANO (DIAPASON)	PIANO SOLO	SUSTAIN UPPER SHORT	SUSTAIN UPPER LONG	SUSTAIN TO FOOT SWITCH	PEDAL SUSTAIN 1	PEDAL SUSTAIN 2	LOWER TO PEDAL	ACCOUSTIC TREMOLO CELESTE
	(S12)	(S13)	(S14)	(S15)	(S16)	(S17)	(S18)	(S19)	(S20)	(S21)	(S22)
1	YEL	YEL	CLEAR	NC	GRA	GRA(2)	NC	NC	NC	NC	NC
2	CLEAR	CLEAR	CLEAR	GRN	RED(2)	RED	NC	NC	NC	NC	NC
3	NC	NC	NC	ORN	NC	NC	NC	NC	NC	NC	NC
4	NC	NC	NC	YEL	NC	NC	NC	NC	NC	NC	SH-YEL
5	ORN	VIO	ORN	WHT	ORN(2)	VIO	GRN(2)	BLU	GRN	BLK	ORN
6	VIO	ORN	VIO	VIO	VIO	ORN	VIO(2)	ORN	BLU(2)	VIO	CLEAR

SWITCH TERM	ACCOUSTIC TREMOLO ON LOWER	ACCOUSTIC TREMOLO CELESTE	ACCOUSTIC TREMOLO CHORUS	VIBRATO 1	VIBRATO 2	DELAY VIBRATO	REVERB 1	REVERB 2	ACCOUSTIC TREMOLO ON REVERB	BRILLANCE	VOLUME SOFT
	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33
1	NC	NC	NC	NC	NC	NC	BRN	NC	NC	NC	NC
2	NC	BLK	NC	NC	VIO	NC	ORN	NC	NC	CLEAR	NC
3	NC	WHT	NC	NC	WHT/BLU	NC	NC	NC	NC	WHT BLK(2)	NC
4	SH-YEL	VIO	YEL	NC	YEL	GRN	NC	ORN(2)	CLEAR	NC	GRN
5	GRN	BLK(2)	CLEAR	GRN	VIO(2)	YEL	WHT/BLK	GRN	GRN(2)	CLEAR	GRA
6	SH-RED	GRN	NC	VIO	GRN	NC	VIO	VIO	VIO	WHT BLK(2)	NC

CHART ABBREVIATION CODE

The PLUG AND PIN NUMBERS WIRING CHART seen on the following pages have been arranged in plug and connector sequence from the lowest plug number first to the highest number last. These charts represent a point to point wiring reference, and the following abreviation code is used.

J - Board Connector
J/T - Junction Terminals (Located rear of organ, just below manual shelf).
J/T #1 - (-28 volts), Violet Wires
J/T #2 - Ground #2, Black Wires
J/T #3 - (-14 volts) Gray Wires
J/T #4 - Ground #1, White/Black Wires
J/T #5 - (+25 volts), Red Wires
J/T #6 - (-8 volts), White Wires
L - Lower
L/M - Lower Manual
L.H.- Left Hand
N.C. - No Connection
P - Plug
Pos. - Position
S - Tab Switches
S1 - Arpeggiator Switch
S2 - Arpeggiator Switch
SH - Shield
T/B - Tone Bar
T/S - Terminal Strip
U - Upper
U/M - Upper Manual
UL - Upper Board - Lower Connector (124-000223-002)
Uu - Upper Board - Upper Connector (124-000223-002)

PLUG AND PIN NUMBERS WIRING CHART OF 11100 SERIES ORGAN

	PLUG NO.	PIN # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
UPPER MANUAL BOARD #1 KEYS 1 THRU 22	#1	J-114U-21 J-139-3	J-116U-3 J-139-2	J-115U-1 J-139-1	J-116U-13 J-138-15	J-116U-18 J-138-14	J-116U-16 J-138-13	J-115U-6 J-138-12	U/M #2-8 J-147-12	J-115U-11 J-138-11	J-114U-11 J-138-10	J-114U-1 J-138-9	J-114U-6 J-138-8	J-115U-18 J-138-7	J-114-19 J-138-6	J-116U-5 J-138-5	J-115U-3 J-138-4	N. C. N.C.	J-116U-15 J-138-3	J-116U-20 J-138-2	J-116U-10 J-138-1	J-115U-8 J-137-15	J-115U-13 J-137-14	J-114U-9 J-137-13	J-115U-21 J-137-12
UPPER MANUAL BOARD #2 KEYS 23 THRU 44	#2	J-114U-4 J-137-11	J-115U-16 J-137-10	J-114U-20 J-137-9	J-116U-4 J-137-8	J-115U-2 J-137-7	J-116U-14 J-137-6	J-116U-19 J-137-5	U/M #1-8 U/M #3-8	J-116U-9 J-137-4	J-115U-7 J-137-3	J-115U-12 J-137-2	J-114U-10 J-137-1	J-115U-22 J-136-15	J-114U-5 J-136-14	J-115U-17 J-136-13	J-114U-18 J-136-12	N.C. N.C.	J-116U-6 J-136-11	J-115U-4 J-136-10	J-116U-16 J-136-9	J-116U-21 J-136-8	J-116U-11 J-136-7	J-115U-9 J-136-6	J-115U-14 J-136-5
UPPER MANUAL BOARD #3 KEYS 45 THRU 61	#3	J-114U-8 J-136-4	J-115U-20 J-136-3	J-114U-3 J-136-2	J-115U-15 J-136-1	J-114U-13 J-135-4	J-116U-2	J-116U-22	U/M #2-8	J-116U-12	N.C.	N.C.	J-116U-17	J-116U-7	N.C.	J-115U-5	J-115U-10	J-114U-12	J-114U-2	J-114U-7	J-115U-19	J-114U-17			
LOWER MANUAL BOARD #1 KEYS 1 THRU 22	#1	J-114L-21	J-116L-3	J-115L-1	J-116L-13	J-116L-18	J-116L-8	J-115L-6	L/M #2-8	J-115L-11	J-114L-11	J-114L-1	J-114L-6	J-115L-18	J-114L-19	J-116L-5	J-115L-3	N.C.	J-116L-15	J-116L-20	J-116L-10	J-116L-8	J-115L-13	J-114L-9	J-115L-21
LOWER MANUAL BOARD #2 KEYS 23 THRU 44	#2	J-114L-4	J-115L-16	J-114L-20	J-116L-4	J-115L-2	J-116L-14	J-116L-19	L/M #1-8 L/M #3-8	J-116L-9	J-115L-7	J-115L-12	J-114L-10	J-115L-22	J-114L-5	J-115L-17	J-114L-18	N.C.	J-116L-6	J-115L-4	J-116L-16	J-116L-21	J-116L-11	J-115L-9	J-115L-14
LOWER MANUAL BOARD #3 KEYS 45 THRU 61	#3	J-114L-8	J-115L-20	J-114L-3	J-115L-15	J-114L-13	J-116L-2	J-116L-22	L/M #2-8 J-147-15 VIA P-87/88	J-116L-12	N.C.	N.C.	J-116L-17	J-116L-7	N.C.	J-115L-5	J-115L-10	J-114L-12	J-114L-2	J-114L-7	J-115L-19	J-114L-17			
TONE CABINET OUTLET	P-1	GND.	P-4-5		P-4-12		P-3-6	P-3-14	P-3-12	P-3-15															
TO TREMOLO ASSEMBLY	P-2	TO FAST MOTOR	TO SLOW MOTOR	TO ROTARY SPEAKER (DOT)	TO FAST MOTOR	TO SLOW MOTOR	TO ROTARY SPEAKER																		
POWER AMP. ASSY. 126-000108-001	P-3	P-10-5	WIRE #7 FROM EAR PHONE JACK ASSY.	TO MAIN SPEAKER (GND)	P-10-8	WIRE #49 FROM EAR PHONE JACK ASSY.	TO P-42-6	WIRE #20 FROM CASS-ETTE TERM-INAL STRIP	P-12-14	P-10-9	-10-1	P-12-15	P-10-6	To P-42-13	To P-42-14	P-10-3									
POWER AMP. ASSY. 126-000108-001	P-4	J/T #5 (+25 V)	P-80-1	J/T #3 (-14 V)	J/T #4 (GND.#1)	WIRE FROM PHONE JACK ASSY.	N. C.	P-80-4	P-80-5	P-80-2	J/T #2 (GND.#2)	N.C.	GRN WIRE FROM EAR PHONE TERM-INAL STRIP	J/T #1 (-28 V)	Wire #48 FROM EAR PHONE JACK ASSY.	J/T #6 (-8 V)								
POWER SWITCH	A.C. SWITCH	P-10-3 (BLUE)	P-10-9 (Yellow)	P-10-6 (GRAY)									NOTE REFER TO PLUG & CONNECTOR LOCATIONS PAGES 2-24 AND 2-25											
MUSIC LITE ASSY.*	P-10	P-3-10 (TO LITE SWITCH)	N.C.	P-3-15	P-10-9 (TO LITE SWITCH)	P-3-1	P-3-12	N. C.	P-3-4	P-3-9															
RHYTHM ASSY.	P-11	J/T #5 (+25 V)	J/T #2 (GND.#2)	P-29-3	J-141-6	N.C.	P-40	J-104-19	J-142-2	J-141-7	J-142-1	P-29-4 (SH.N.C.)	P-29-1	N.C.	P-29-6	P-29-2									
SWELL PEDAL	P-12	P-19-2	P-19-3 J-144-5	J-144-7	J-145-17	J-145-15	N.C.	TO ANIMA-TION CANCEL TERMINAL STRIP 063-050504	J-257-14	N.C.	J/T #4 (GND#1)	P-30-3	N.C.	N.C.	P-3-8	P-3-11									
PEDAL SWITCH ASSY. PEDALS 13 THRU 25	P-13	J-112L-13	J-112L-5	J-112L-3	J-112L-4	J-112L-5	J-112L-6	J-112L-7	J-112L-11	J-112L-9	J-112L-10	J-112L-8	J-112L-12	J-112L-1	N.C.	N.C.									
PEDAL SWITCH ASSY. PEDAL 1 THRU 12	P-14	J-111L-13	J-111L-5	J-111L-3	J-111L-4	J-111L-2	J-111L-6	J-111L-7	J-111L-11	J-111L-9	J-111L-10	J-111L-8	J-111L-12	N.C.	J/T #2 (GND.#2)	P-101									
CONNECTORS	P-19	J-144-8	P-12	P-12																					
	P-20	J-143-2	J-143-8	J-143-6																					
CONNECTORS	P-21	J-146-2	J-146-3	J-146-4	J-146-5	J-117U-4 THRU 5	N.C.																		
	P-22	J-126-6 P-35-1	S-28-5	S-27-3	S-27-4	J-126-4	N.C.																		
CONNECTORS	P-26	J-127-3																							
	P-27	J-125-7																							

FIGURE 3-37
PLUG AND PIN NUMBERS WIRING CHART
(PLUG #1 THRU 27) SEE FIGURE 3-36
FOR ABBREVIATIONS CODE

	15	16	17	18	19	20	21	22	23	24
4	J-157-9									
-4	N.C.									

NOTE

REFER TO PLUG & CONNECTOR LOCATIONS

PAGES 2-24 AND 2-25

	PLUG NO.	18	19	20	21 -	22	23	24
CONNECTOR	P-83 - - - P-84							
CONNECTOR	P-87 - - - - P-88							
CONNECTOR	P-10 - - - - P-10							
SINE WAVE FILTER #1 124-000201 (8-U)	J-10							
SINE WAVE FILTER #1 124-000201 (8-L)	J-10							
SINE WAVE FILTER #2 124-000202 (9-U)	J-10	& CONNECTOR LOCATIONS -24 AND -2-26						
SINE WAVE FILTER #2 124-000202 (9-L)	J-10							
SINE WAVE FILTER #3 124-000204 (10-U.)	J-10							
SINE WAVE FILTER #3 124-000204 (10-L)	J-10							
PEDAL FILTER BOARD 124-000206 (13)	J-10	4 #1)	N.C.	P-11-7 J-141-5	P-14-15 via P101/102	J.T. -1 (-28 V)	J.T.-5 (+25 V)	
BRIGHT PERC. BOARD 124-000208 (14)	J-10	-11 4 #1)	N.C.	N.C.	J-144-10 via P-35/36	J-126-8	N.C.	
CONNECTOR	P-10 - - - P-10							
U/M SYNTH. BOARD 124-000223-002 (2)	J-10	U-5	J-103-6	J-143-5 via P-46/45	N.C.	J/T -2 (#2 GND)	J-129-11	

FIGURE 3-39
PLUG AND PIN NUMBER WIRING CHART
(PLUG #83 THRU J-108U) SEE FIGURE
3-36 FOR ABBREVIATIONS CODE

PLUG AND PIN NUMBERS WIRING CHART FOR 11100 SERIES ORGAN

	PLUG NO.	PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CONNECTORS	P-29	P-11-12	P-11-15	P-11-3	P-11-11	N.C.	P-11 14																		
	P-30	J-144-9	J-257-6	P-13-11	N.C.	N.C.	N.C.																		
CONNECTORS	P-31	J-108U-3	J-113U-2	J-113U-3	J-113U-4	J-113U-5	N.C.																		
	P-32	J-126-10	S-16-5	S-16-6	S-2-1	S-2-2	N.C.																		
CONNECTORS	P-33	S-32-2	SH.N.C.	S-23-5	S-19-6 P-57	N.C.	N.C.																		
	P-34	J-142-9	J-142-5	J-142-10	J-141-11	N.C.	N.C																		
CONNECTORS	P-35	P-22-1	J-106-20	J-106-18																					
	P-36	J-257-20	J-144-10	N.C.																					
CONNECTORS	P-40	P-11-6																							
	P-41	J-147-9																							
CONNECTORS	P-42	J-257-10	J-257-12	J-257-16	J-257-17	J-257-18	P-3-6	J-145-2	J-145-8	J-145-11	J-257-5	J-145-3	N.C.	P-3-13	P-3-14	J-157-9									
	P-43	S-33-4	S-31-4	S-31-5	S-30-4	S-29-1	S-24-6	S-25-4	S-25-5	S-31-6	J-143-7	SH.NC.	N.C.	S-24-3	S-24-4	N.C.									
CONNECTORS	P-45	J-143-14																							
	P-46	J-108U-19																							
CONNECTORS	P-47	J-102U-11																							
	P-48	J-143-5																							
CONNECTORS	P-53	J-113L-4	J-113L-5	N.C.																					
	P-54	S-21-6	S-20-6	N.C.																					
CONNECTORS	P-57	P-33-4																							
	P-58	J-113L-2																							
CONNECTORS	P-62	J-117L-3																							
	P-63	J/T #1 (-28 V)																							
CONNECTORS	P-66	J-142-8																							
	P-67	J-102L-11																							
CONNECTORS	P-70	J-104-7	J-104-4	N.C.																					
	P-71	J-108L-2	J-108L-3	N.C.																					
CONNECTORS	P-73	J-109U-14																							
	P-74	J/T #1 (-28V)																							
CONNECTORS	P-76	S-20-5																							
	P-77	J-108L-19																							
CONNECTORS	P-79	J-145-1	J-145-21	N.C.	J-145-19	J-145-20	N.C.																		
	P-80	P-4-2	P-4-9	N.C.	P-4-7	P-4-8	N.C.																		

NOTE
REFER TO PLUG & CONNECTOR LOCATIONS
PAGES 2-24 AND 2-25

FIGURE 3-38
PLUG AND PIN NUMBER WIRING CHART
(PLUG #29 THRU 80) SEE FIGURE 3-36
FOR ABBREVIATIONS CODE

PLUG AND PIN NUMBERS WIRING CHART OF 11100 SERIES ORGAN

	PLUG NO.	PIN # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CONNECTOR	P-83 - - - - - - - - - - - - P-84	U/M #1-8 - - - - - - - - - - - - J-147-12																							
CONNECTOR	P-87 - - - - - - - - - - - - P-88	J-147-15 - - - - - - - - - - - - L/M #3-8																							
CONNECTOR	P-101 - - - - - - - - - - - - P-102	P-14-15 - - - - - - - - - - - - J-104-20																							
SINE WAVE FILTER #1 124-000201 (8-U)	J-101U	J-102U-1	N.C.	N.C.	J-113U-1	J-113U-10	J-108U-13	J-113U-12	J-108U-14	N.C.	J.T.-2 (GND. #2)	J-102U-9	N.C.												
SINE WAVE FILTER #1 124-000201 (8-L)	J-101L	J-012L-1	N.C.	N.C.	J-113L-1	J-110L-10	J-108L-13	J-113L-12	J-108L-14	N.C.	J.T.-2 (GND. #2)	J-102-9	N.C.												
SINE WAVE FILTER #2 124-000202 (9-U)	J-102U	J-101U-1 J-103U-1	N.C.	J-103U-4 J.T. -6 (-8 V)	J-113U-11	J-113U-7	J-113U-6	J-113U-8	J.T. 5 (+25 V)	J-101U-11	J.T. 2 (GND. #2)	J-143-5 Via P-47-48	J-103U-11		NOTE	REFER TO PLUG & CONNECTOR LOCATION'S PAGES 2-24 AND 2-26									
SINE WAVE FILTER #2 124-000202 (9-L)	J-102L	J-101L-1 J-103L-1	N.C.	J.T. 6 (-8 V) J-103L-4	J-113L-11	J-113L-7	J-113L-6	J-113L-8	J.T. 5 (+25 V)	J-101L-11	J.T. 2 (GND. #2)	J-142-8 Via P-66/67	J-103L-11												
SINE WAVE FILTER #3 124-000204 (10-U.)	J-103U	J-102U-1	N.C.	N.C.	J-102U-3	J-108U-17	J-108U-18	J-108U-16	J-108U-15	J-113U-9	J.T. 2 (GND.#2)	J-102U-12	N.C.												
SINE WAVE FILTER #3 124-000204 (10-L)	J-103L	J-102L-1	N.C.	N.C.	J-102L-3	J-108L-17	J-108L-18	J-108L-16	J-108L-15	J-113L-9	J.T. 2 (GND. #2)	J-102L-12	N.C.												
PEDAL FILTER BOARD 124-000206 (13)	J-104	J-141-9	J-141-1	N.C.	J-108L-3 Via P-70/71	N.C.	N.C.	J-108L-2 Via P-70/71	N.C.	N.C.	J-142-6	N.C.	N.C.	N.C.	N.C.	POS. #8 PEDAL T/B ASSY.	POS. #8 PEDAL T/B ASSY.	J.T. 4 (GND. #1)	N.C.	P-11-7 J-141-5	P-14-15 via P101/102	J.T. -1 (-28 V)	J.T.-5 (+25 V)		
BRIGHT PERC. BOARD 124-000208 (14)	J-106	N.C.	J-126-15	S-15-6 via P-108/109 J-125 U/M -6	J-125-10	N.C.	N.C.	S-14-1	S-13-2	N.C.	N.C.	N.C.	S-12-2	S-11-2	S-10-5	N.C.	N.C.	J-126-11 J.T.-4 (GND. #1)	N.C.	N.C.	J-144-10 via P-35/36	J-126-8	N.C.		
CONNECTOR	P-108 - - - - - - - - - - - - P-109	J-106-3 S-15-6 - - - - - - - - - - - - J-245U-6																							
U/M SYNTH. BOARD 124-000223-002 (2)	J-108U	J-129-1 via J/T -3	N.C.	J-126-10 via P-31/32-1	J-129-10	J-129-9	J-129-8	J-129-7	J-129-6	J-129-5	J-129-4	J-129-3	J-129-2	J-101U-6	J-101U-8	J-103U-8	J-103U-7	J-103U-5	J-103-6	J-143-5 via P-46/45	N.C.	J/T -2 (#2 GND)	J-129-11		

FIGURE 3-39
PLUG AND PIN NUMBER WIRING CHART (PLUG #83 THRU J-108U) SEE FIGURE 3-36 FOR ABBREVIATIONS CODE

14	15	16	17	18	19	20	21	22	23	24
J-101L-8	J-103L-8	J-103L-7	J-103L-5	J-103L-6	S-20-5 via P-76/77	J.T - 2 (GND #2)	N.C.	J-131-11		
J/T #1 (-28 V) via P-73/74 (-28 V)	N.C.									
N.C.	N.C.									
N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.		
N.C.	N.C.									
N.C.	N.C.									
N.C.	N.C.									
NOTE REFER TO PLUG & CONNECTOR LOCATION PAGES 2-24 AND 2-25										
N.C.	N.C.	N.C.	U/M #3-21	U/M #2-16	U/M #1-14	U/M #2-3	U/M #1-1	N.C.		
N.C.	N.C.	N.C.	L/M #1-21	L/M #2-16	L/M #1-14	L/M #2-3	L/M #1-1	N.C.		
U/M #2-24	U/M #3-4	U/M #2-2	U/M #2-15	U/M #1-13	U/M #3-20	U/M #3-2	U/M #1-24	U/M #2-13		

	P	17	18	19	20	21	22	23	24
L/M SYNTH. BOARD 124-000223 (4)	J-1	#2-15	L/M #1-13	L/M #3-20	L/M #3-2	L/M #1-24	L/M #2-13		
U/M SYNTH BOARD 124-000223-002 (2)	J-1	#1-12	U/M #1-5	U/M #2-7	U/M #1-19	U/M #2-21	U/M #3-7		
L/M SYNTH. BOARD 124-000223 (4)	J-1	#3-12	L/M #1-5	L/M #2-7	L/M #1-19	L/M #2-21	L/M #3-7		
U/M SYNTH. BOARD 124-000223-002 (2)	J-1	-4 THRU 15 /22-5							
L/M SYNTH. BOARD 124-000223 (4)	J-1								
U/M SYN. PERC. BD. 124-000350 (11)	J-1	REFER TO PLUG & CONNECTOR LOCATIONS PAGES 2-24 AND 2-25							
U/M SYN. PERC. BD. (11)	J-1								
U/M PRE-SET BOARD 124-000351 (6)	J-1	T/B	U/M T/B 8'	U/M T/B 5-1/3'	U/M T/B 16'	N. C.	N.C.		
U/M PRE-SET BOARD 124-000351 (6)	J-1								
U/M PRE-SET BOARD 124-000351 (6)	J-1								
L/M PRE-SET BOARD 124-000352 (7)	J-1								
L/M PRE-SET BOARD 124-000352 (7)	J-1								
ARPEGGIATOR BOARD ASSEMBLY	J-1								
ARPEGGIATOR BOARD ASSEMBLY	J-1								

FIGURE 3-41
PLUG AND PIN NUMBERS WIRING CHART
(J-115 THRU J-136) SEE FIGURE 3-36
FOR ABBREVIATIONS CODE

PLUG AND PIN NUMBERS WIRING CHART OF 11100 SERIES ORGAN

	PLUG NO.	PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
U/M SYNTH. BOARD 124-000223 (4)	J-108L	J-131-1	J-104-7 via 70/71-1	J-104-4 via 70/71-2	J-131-10	J-131-9	J-131-8	J-131-7	J-131-6	J-131-5	J-131-4	J-131-3	J-131-2	J-101L-6	J-101L-8	J-103L-8	J-103L-7	J-103L-5	J-103L-6	S-20-5 via P-76/77	J.T - 2 (GND #2)	N.C.	J-131-11		
U/M SYNTH. BOARD 124-000223-002 (2)	J-109U	J-109L-1	J-109L-2	J-109L-3	J-109L-4	J-109L-5	J-109L-6	J-109L-7	J-109L-8	J-109L-9	J109L-10	J-109L-11	J-109L-12	N.C.	J/T #1 (-28 V) via P-73/74 (-28 V)	N.C.									
U/M SYNTH. BOARD 124-000223 (4)	J-109L	J-109U-1	J-109U-2	J-109U-3	J-109U-4	J-109U-5	J-109U-6	J-109U-7	J-109U-8	J109U-9	J-109U-10	J-109U-11	J-109U-12												
U/M SYNTH. BOARD 124-000223-002 (2)	J-110Uu	J-146-22	J-146-21	J-146-20	J-146-19	J-146-18	J-146-17	J-146-16	J-146-15	J-146-14	J-146-13	J-146-12	J-146-11	J-146-10	N.C.	N.C.									
U/M SYNTH. BOARD 124-000223-002 (2)	J-110U1	J-110L-1	J-110L-2	J-110L-3	J-110L-4	J-110L-5	J-110L-6	J-110L-7	J-110L-8	J-110L-9	J-110L-10	J-110L-11	J-110L-12	J-110L-13	N.C.	N.C.	N.C.	N.C.	N,C.	N.C.	N.C.	N.C.	N.C.		
U/M SYNTH. BOARD 124-000223 (4)	J-110L	J-110U-1	J-110U-2	J-110U-3	J-110U-4	J-110U-5	J-110U-6	J-110U-7	J-110U-8	J-110U-9	J-110U-10	J-110U-11	J-110U-12	J-110U-13	N.C.	N.C.									
L/M SYNTH. BOARD 124-000223 (4)	J-111L	N.C.	P-14-5	P-14-3	P-14-4	P-14-2	P-14-6	P-14-7	P-14-11	P-14-9	P-14-10	P-14-8	P-14-12	P-14-1	N.C.	N.C.									
L/M SYNTH. BOARD 124-000223 (4)	J-112L	P-13-13	P-13-5	P-13-3	P-13-4	P-13-2	P-13-6	P-13-7	P-13-11	P-13-9	P-13-10	P-13-8	P-13-12	P-13-1	N.C.	N.C.									
U/M SYNTH. BOARD 124-000223-002 (2)	J-113U	J-101U-4	S-16-5 via P-31/32-2	S-27-3 via P-31/32-3	S-27-4 via P-31/32-4	J-126-4 via P-31/32-5	J-102U-6	J-102U-5	J-102U-7	J-103U-9	J-101U-5	J-102U-4	J-101U-7												
L/M SYNTH. BOARD 124-000223 (4)	J-113L	J-101L-4	J-141-11 via 57/58-6 P-33/34-4	N.C.	S-21-6 via P-53/54-1	S-20-6 via P-53/54-2	J-102L-6	J-102L-5	J-102L-7	J-103L-9	J-101L-5	J-102L-4	J-101L-7												
U/M SYNTH. BOARD 124-000223-002 (2)	J-114U	U/M #1-11	U/M #3-18	U/M #3-3	U/M #2-1	U/M #2-14	U/M #1-12	U/M #3-19	U/M #3-1	U/M #1-23	U/M #2-12	U/M #1-10	U/M #3-17	U/M #3-5	N.C.	N.C.	N.C.	U/M #3-21	U/M #2-16	U/M #1-14	U/M #2-3	U/M #1-1	N.C.		
L/M SYNTH. BOARD 124-000223 (4)	J-114L	L/M #1-11	L/M #3-18	L/M #3-3	L/M #2-1	L/M #2-14	L/M #1-12	L/M #3-19	L/M #3-1	L/M #1-23	L/M #2-12	L/M #1-10	L/M #3-17	L/M #3-5	N.C.	N.C.	N.C.	L/M #1-21	L/M #2-16	L/M #1-14	L/M #2-3	L/M #1-1	N.C.		
U/M SYNTH. BOARD 124-000223-002 (2)	J-115-U	U/M #1-3	U/M #2-5	U/M #1-16	U/M #2-19	U/M #3-15	U/M #1-7	U/M #2-10	U/M #1-21	U/M #2-23	U/M #3-16	U/M #1-9	U/M #2-11	U/M #1-22	U/M #2-24	U/M #3-4	U/M #2-2	U/M #2-15	U/M #1-13	U/M #3-20	U/M #3-2	U/M #1-24	U/M #2-13		

NOTE: P-13 & P-14 LOCATED AT PEDAL SWITCH ASSEMBLY

NOTE

REFER TO PLUG & CONNECTOR LOCATION PAGES 2-24 AND 2-25

FIGURE 3-40
PLUG AND PIN NUMBERS WIRING CHART
(J-108L THRU J-115) SEE FIGURE 3-36
FOR ABBREVIATIONS CODE

PLUG AND PIN NUMBERS WIRING CHART OF 11100 SERIES ORGAN

	PLUG NO.	PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
L/M SYNTH. BOARD 124-000223 (4)	J-115L	L/M #1-3	L/M #2-5	L/M #1-16	L/M #2-19	L/M #3-15	L/M #1-7	L/M #2-10	L/M #1-21	L/M #2-23	L/M #3-16	L/M #1-9	L/M #2-11	L/M #1-22	L/M #2-24	L/M #3-4	L/M #2-2	L/M #2-15	L/M #1-13	L/M #3-20	L/M #3-2	L/M #1-24	L/M #2-13		
U/M SYNTH BOARD 124-000223-002 (2)	J-116U	N.C.	U/M #3-6	U/M #1-2	U/M #2-4	U/M #1-15	U/M #2-18	U/M #3-13	U/M #1-6	U/M #2-9	U/M #1-20	U/M #2-22	U/M #2-9	U/M #1-4	U/M #2-6	U/M #1-18	U/M #2-20	U/M #1-12	U/M #1-5	U/M #2-7	U/M #1-19	U/M #2-21	U/M #3-7		
L/M SYNTH. BOARD 124-000223 (4)	J-116L	N.C.	L/M #3-6	L/M #1-2	L/M #2-4	L/M #1-15	L/M #2-18	L/M #2-13	L/M #1-6	L/M #2-9	L/M #1-20	L/M #2-22	L/M #3-9	L/M #1-4	L/M #2-6	L/M #1-18	L/M #2-20	L/M #3-12	L/M #1-5	L/M #2-7	L/M #1-19	L/M #2-21	L/M #3-7		
U/M SYNTH. BOARD 124-000223-002 (2)	J-117U	N.C.	N.C.	N.C.	126-4	126-4 NOTE; 117U-4 THRU 15 via P-21/22-5	126-4	126-4	126-4	126-4	126-4	126-4	126-4	126-4	126-4	126-4	NOTE:	117U-4 THRU 15 via P-21/22-5						
L/M SYNTH. BOARD 124-000223 (4)	J-117L	N. C.	S-2 AT ARP. SWITCH	J/T-1 via P-62/63 (-28V)	J-139-14	J-139-10 NOTE: AT ARP. SWITCH 4 THRU 15	J-139-12	J-139-11	J-139-13	J-139-9	J-139-8	J-139-4	J-139-6	J-139-5 NOTE: AT ARP. SWITCH 4 THRU 15	J-139-7	J-139-15								
U/M SYN. PERC. BD. 124-000350 (11)	J-125	J/T-2 (GND. #2)	J-147-20	S-5-5	S-3-6	S-2-5	J-147-5	J-127-3 via P-26/27	S-9-2	S-9-6	J-106-4	S-7-4	S-3-1	S-1-4	S-1-6	S-15-4									
U/M SYN. PERC. BD. (11)	J-126	S-1-1	J-147-3	J-147-4 J-4	J-147-13 J-117U-4 THRU 15 VIA (P-21/22)	J.T-1 (-28 V)	S-26-6	J-147-1	J-106-21	J/T-5 (+25 V)	J-108U-3 via P-21/22	J-106-17	S-10-4	N.C.	S-14-2	J-106-2									
U/M PRE-SET BOARD 124-000351 (6)	J-127	N.C.	N.C. VIA P-26	J-125-7 via P-26/27	J-245U-1	POS. #8 U/M Tone/ Bar Assy.	J-245U-7	J-245U-2	J-245"-5	J-245U-3	J-245U-4	Pos. #1 U/M Tone/ Bar Return	U/M T/B 1'	U/M T/B 1-1/2'	U/M T/B 1-3/5'	U/M T/B 2'	U/M T/B 2-2/3'	U/M T/B 4'	U/M T/B 8'	U/M T/B 5-1/3'	U/M T/B 16'	N. C.	N.C.		
U/M PRE-SET BOARD 124-000351 (6)	J-128	N.C.	J-147-14	S-4-2	S-3-2	S-7-5	S-8-5	S-6-5	S-8-2	S-5-2	S-7-2	N.C.	N.C.												
U/M PRE-SET BOARD 124-000351 (6)	J-129	J-108U-1	J-108U-12	J-108U-11	J-108U-10	J-108U-9	J-108U-8	J-108U-7	J-108U-6	J-108U-5	J-108U-4	J-108U-22	J/T-2 (GND. #2)												
L/M PRE-SET BOARD 124-000352 (7)	J-130	J-245L-5	J-245L-3	J-245L-4	N.C.	N.C.	Pos. #1 L/M Tone Bar Return	L/M T/B 1'	L/M T/B 1-1/3'	L/M T/B 1-3/5'	L/M T/B 2'	L/M T/B 2-2/3'	L/M T/B 4'	L/M T/B 8'	L/M T/B 5-1/3'	L/M T/B 16'									
L/M PRE-SET BOARD 124-000352 (7)	J-131	J-108L-1 J/T #3 (-14 V)	J-108L-12	J-108L-11	J-108L-10	J-108L-9	J-108L-8	J-108L-7	J-108L-6	J-108L-5	J-108L-4	J-108L-22	J/T-2 (GND. #2)												
ARPEGGIATOR BOARD ASSEMBLY	J-135	N.C.	N.C.	N.C.	U/M #3-5																				
ARPEGGIATOR BOARD ASSEMBLY	J-136	U/M #3-4	U/M #3-3	U/M #3-2	U/M #3-1	U/M #2-24	U/M #2-23	U/M #2-22	U/M #2-21	U/M #2-20	U/M #2-19	U/M #2-18	U/M #2-16	U/M #2-15	U/M #2-14	U/M #2-13									

NOTE

REFER TO PLUG & CONNECTOR LOCATIONS PAGES 2-24 AND 2-25

FIGURE 3-41
PLUG AND PIN NUMBERS WIRING CHART (J-115 THRU J-136) SEE FIGURE 3-36 FOR ABBREVIATIONS CODE

14	15	16	17	18	19	20	21	22	23	24
U/M #1-22	U/M #1-21									
U/M #1-5	U/M #1-4									
117-4	J-117-15									
18-5 108-19 a 45/46	N.C.									
/T-4 GND.#1)	P-12-5	J-257-2	P-12-4	J-257-7	P-4-7 via P-79/80	P-4-8 via P-79/80	P-4-9 via P-79/80	J/T-5 (+25 V)		
J-110U-9	J-110U-8	J-110U-7	J-110U-6	J-110U-5	J-110U-4	J-110U-3	J-110U-2	J-110U-1	N.C.	N.C.
/T -1 -28 V) -128-2	U/M #1-8 via P-83/84	J/T-2 (GND #2)	To Re- peat Pot.	To Re- peat Pot	S-28-4	J-125-2	S-16-2	N.C.		
		NOTE								
		REFER TO PLUG & CONNECTOR LOCATIONS PAGES 2-24 AND 2-25								
-12-8	J/T-1 (-28 V)	S-31-5	S-30-4	S-29-1	J-150-1	J-146-2 via P/35/36 P-21/22	N.C.	N.C.	J/T-4 (GND #1)	J-145-4

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3-1. GENERAL.– This section cor
necessary to proper organ se

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FIGURE			PAGE
	LIST OF ILLUSTRATIO	124-000208)...(14)	.. 3-19
3-43	16,000 SERIES CONSO	124-000376)....(15)	.. 3-49
3-44	16,000 SERIES CONSO	124-000377)....(16)	.. 3-21
3-45	16,000 SERIES CONSO		
3- 4	MDD GENERATOR BOARD Schematic, Layout a	124-000424)....(17)	.. 3-50
3- 5	UPPER MANUAL SYNTHE Schematic, Layout a	124-000166).....	3-26
		126-000117 thru 118)	.. 3-51
3- 6	STAIRCASE WAVE PERC Schematic, Layout a	126-000117 thru 118)..	3-52
3- 7	LOWER MANUAL SYNTHE Schematic, Layout a	124-000169)	3-29
		.....	3-54
3- 8	LOWER MANUAL SYNTHE Schematic, Layout a	.....	3-55
3- 9	UPPER MANUAL PRESET Schematic and Layou	124-000430)	3-56
		124-000430)	3-57
3-10	LOWER MANUAL PRESET Schematic and Layou	.....	3-58
3-11	I.C. 380 DIVIDER KE Schematic	.....	3-59
		.....	3-59
3-12	SINE WAVE FILTER #1 Schematic, Layout a	P-1 THRU P-27)	3-60
3-13	SINE WAVE FILTER #2 Schematic and Layou	P31 THRU P-80).....	3-61
3-14	SINE WAVE FILTER #3 SCHEMATIC AND LAYOU	J-83 THRU J-108U).....	3-62
3-15	UPPER MANUAL SYNTHE Schematic and Layou	J-108L THRU J-115U)....	3-63
3-16	REPEAT OSCILLATOR A Schematic and Layou	J-115L THRU J-131) ..	3-64
3-17	PEDAL FILTER BOARD	J-141 THRU J-255) ..	3-65

PLUG AND PIN NUMBERS WIRING CHART OF 11100 SERIES ORGAN

	PLUG NO.	PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
ARPEGGIATOR BOARD ASSEMBLY	J-137	U/M #2-12	U/M #2-11	U/M #2-10	U/M #2-9	U/M #2-7	U/M #2-6	U/M #2-5	U/M #2-4	U/M #2-3	U/M #2-2	U/M #2-1	U/M #1-24	U/M #1-23	U/M #1-22	U/M #1-21									
ARPEGGIATOR BOARD ASSEMBLY	J-138	U/M #1-20	U/M #1-19	U/M #1-18	U/M #1-16	U/M #1-15	U/M #1-14	U/M #1-13	U/M #1-12	U/M #1-11	U/M #1-10	U/M #1-9	U/M #1-7	U/M #1-6	U/M #1-5	U/M #1-4									
ARPEGGIATOR BOARD ASSEMBLY	J-139	U/M #1-3	U/M #1-2	U/M #1-1	J-117-11	J-117-13	J-117-12	J-117-14	J-117-10	J-117-9	J-117-5	J-117-7	J-117-6	J-117-8	J-117-4	J-117-15									
AUTO CHORD BOARD 124-000360 (17)	J-141	J-104-2	N.C.	J/T-4 (GND. #1)	N.C.	J-104-19	P-11-4	P-11-9	J/T-1 (-28 V)	J-104-1	N.C.	S-19-6 J-113-2	N.C.												
AUTO CHORD BOARD 124-000360 (17)	J-142	P-11-10	P-11-8	N.C.	J/T #4 (GND.#1)	N.C.	J-104-10	J/T-5 (+25 V)	J-102-11 via P-66/67	S-32-2 via P-33/34	S-23-5 J-113-2	8' PEDAL TERM. STRIP	16' PED TERM. STRIP												
MIXER #2 BOARD 124-000374 (15)	J-143	S-22-5	J-144-8 via P-19/20	N.C.	S-32-5	J-102U-11 via P-47/48	P-12-2 via P-19/20	J-257-5 via P-42/43	P-12-1	S-22-6	S-23-6	S-23-4	S-22-4	S-18-6	S-18-5 J-108-19 via P-45/46	N.C.									
MIXER #1 BOARD 124-000374 (15)	J-144	J-257-13	N.C.	J-257-11 J/T-5 (+25 V)	J/T-3 (-14 V)	P-12-2	J-257-1	P-12-3	J-143-2 via P-19/20	P-11-12 via P-29/30	J-106-20 via P-35/36	N.C.	J/T-4 (GND #1)												
MIXER #3 BOARD 124-000377 (16)	J-145	P-4-2 via P-79/80	S-25-4 via P-42/43	P-42-11	J-257-24	N.C.	N.C.	N.C.	S-25-5 via P-42/43	N.C.	N.C.	S-31-6 via P-42/43	N.C.	N.C.	J/T-4 (GND.#1)	P-12-5	J-257-2	P-12-4	J-257-7	P-4-7 via P-79/80	P-4-8 via P-79/80	P-4-9 via P-79/80	J/T-5 (+25 V)		
MDD GENERATOR BOARD 124-000265 (1)	J-146	N.C.	J-16-6 via P-21/22-1	S-28-5 via P-21/22-2	S-27-3 via P-21/22-3	S-27-4 via P-21/22-4	N.C.	J/T-2 (#2 GND)	J/T-3 (-14 V)	J/T-1 (-28 V)	J-110-3	J-110-12	J-110U-11	J-110U-10	J-110U-9	J-110U-8	J-110U-7	J-110U-6	J-110U-5	J-110U-4	J-110U-3	J-110U-2	J-110U-1	N.C.	N.C.
REPEAT OSC. AND DETECTOR BOARD 124-000353 (12)	J-147	J-126-7 J-147-7	N.C.	J-126-2	J-126-3	J-125-6	N.C.	J/T-3 (-14 V) J-147-1	S-1-3	P-11-6 via P-40/41	N.C.	S-9-4	L/M #3-8 via P-87/88	J-126-4	J/T -1 (-28 V) J-128-2	U/M #1-8 via P-83/84	J/T-2 (GND #2)	To Repeat Pot.	To Repeat Pot	S-28-4	J-125-2	S-16-2	N.C.		
REVERB AMP. ED. 124-000166	J-150	J-257-19	N.C.	J/T #5 (+25 V)	SH. N.C.	J/T #4 (GND. #1)	J-257-3	J-157-4	SH. N.C.	SH. N.C.							NOTE								
UPPER MANUAL PISTON PRESETS	J-245U	J-127-4	J-127-7	J-127-9	J-127-10	J-127-8	J-106-3 S-5-6 via P-108/109	J-127-6	N.C.	N.C.							REFER TO PLUG & CONNECTOR LOCATIONS PAGES 2-24 AND 2-25								
LOWER MANUAL PISTON PRESETS	J-245L	N.C.	N.C.	J-130-2	J-130-3	J-130-1	J/T #6 (-8 V)	Pos. 8 L/M Tone Var. Assy.	N.C.	N.C.															
MISCELLANEOUS BOARD 124-000365 (18)	J-257	J-144-6	J-145-16	J-150-6	J-150-7	J-143-7 via P-42/43	P-11-15 via P-29/30	J-145-18	N.C.	N.C.	S-33-4	J-144-3	S-31-4	J-144-1	P-12-8	J/T-1 (-28 V)	S-31-5	S-30-4	S-29-1	J-150-1	J-146-2 via P/35/36 P-21/22	N.C.	N.C.	J/T-4 (GND #1)	J-145-4
STAIR CASE WAVE PERC. BOARD 124-000340 (3)		BOARD PLUGS INTO MOTHER BOARD 124-000223-002																							
L/M SYNTHESIS DAUGHTER ED. 124-000341 (5)		BOARD PLUGS INTO MOTHER BOARD 124-000223																							

FIGURE 3-42
PLUG AND PIN NUMBER WIRING CHART
(J-137 THRU J-257) SEE FIGURE 3-36
FOR ABBREVIATIONS CODE

SECTION III
DIAGRAMS AND TEXT

3–1. GENERAL.– This section contains schematic diagrams and text to illustrate and provide information necessary to proper organ servicing.

LIST OF ILLUSTRATIONS

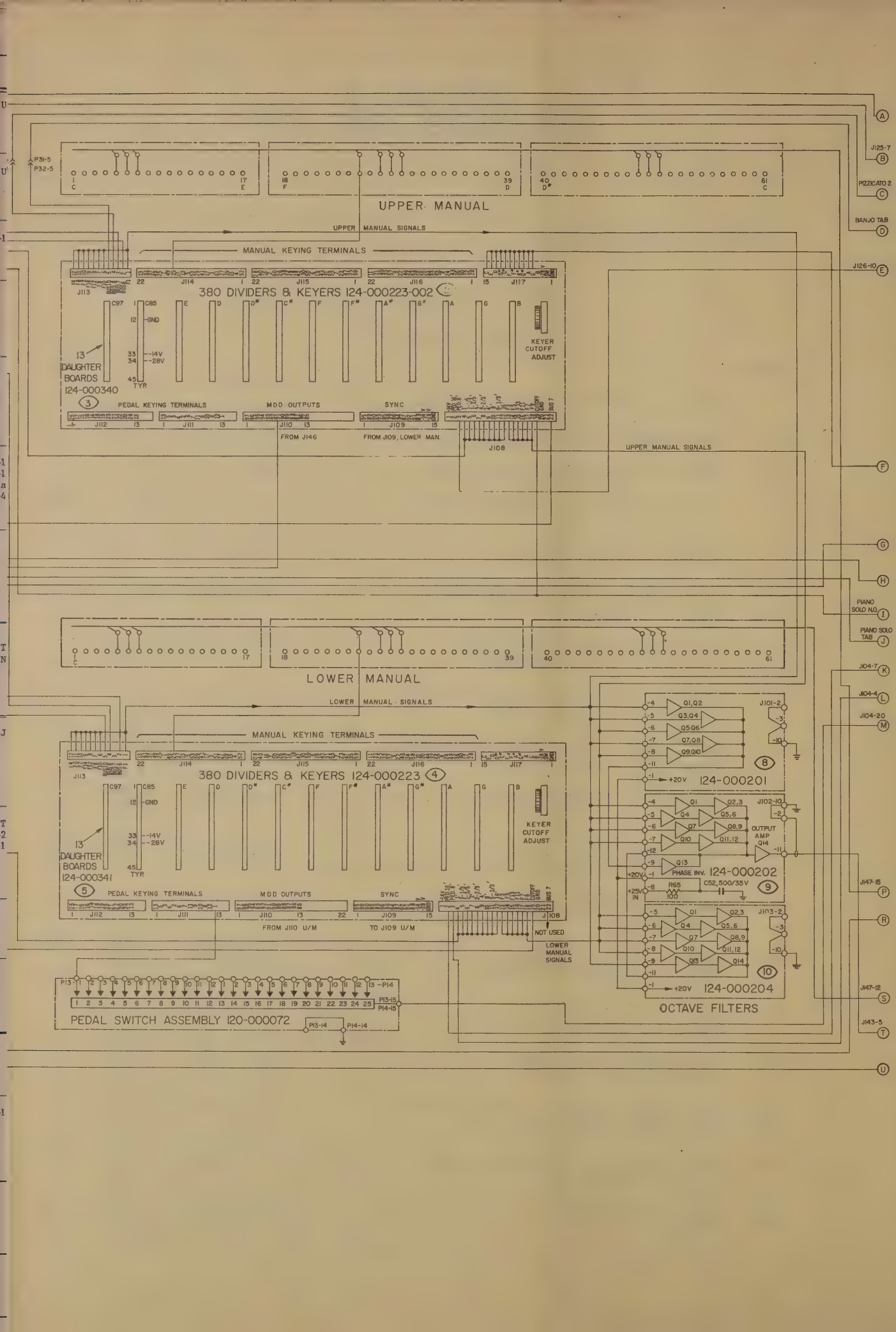
16,000 SERIES

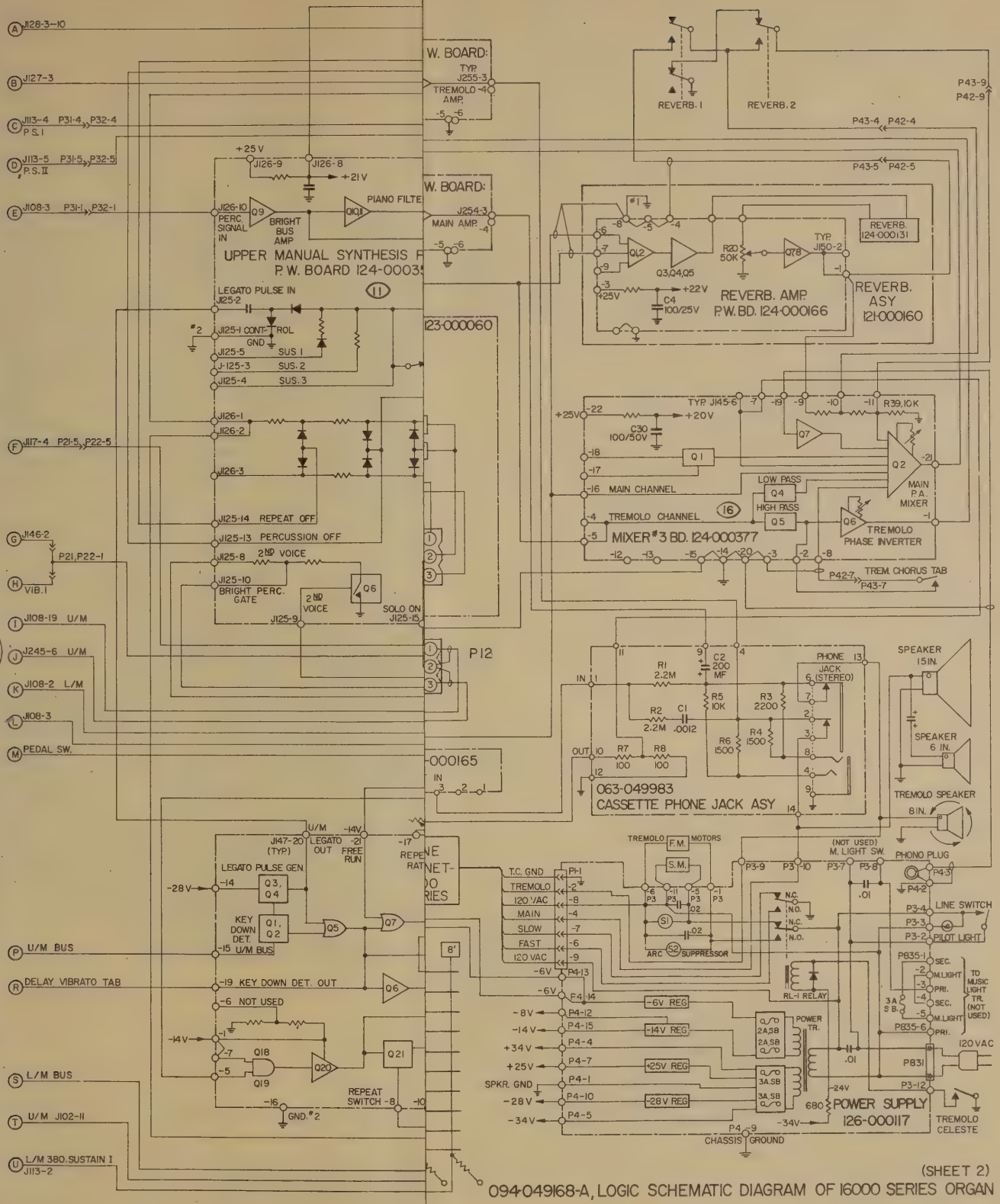
FIGURE				PAGE
	LIST OF ILLUSTRATIONS (16,000 SERIES)			3-45
3-43	16,000 SERIES CONSOLE LOGIC DIAGRAM	(SHEET 1 OF 2)		3-46
3-44	16,000 SERIES CONSOLE LOGIC DIAGRAM	(SHEET 2 OF 2)		3-47
3-45	16,000 SERIES CONSOLE BLOCK DIAGRAM			3-48
3- 4	MDD GENERATOR BOARD Schematic, Layout and Theory	(124-000265)	(1)	3- 5
3- 5	UPPER MANUAL SYNTHESIS MOTHER BOARD Schematic, Layout and Theory	(124-000223-002)	(2)	3- 6
3- 6	STAIRCASE WAVE PERCUSSION BOARD Schematic, Layout and Theory	(124-000340)	(3)	3- 7
3- 7	LOWER MANUAL SYNTHESIS DAUGHTER BOARD Schematic, Layout and Theory	(124-000223)	(4)	3- 8
3- 8	LOWER MANUAL SYNTHESIS DAUGHTER BOARD Schematic, Layout and Theory	(124-000341)	(5)	3- 9
3- 9	UPPER MANUAL PRESET BOARDS Schematic and Layout	(124-000351)	(6)	3-10
3-10	LOWER MANUAL PRESET BOARD Schematic and Layout	(124-000352)	(7)	3-11
3-11	I.C. 380 DIVIDER KEYER PACKAGE Schematic	(075-000380)		3-12
3-12	SINE WAVE FILTER #1 BOARD Schematic, Layout and Theory	(124-000201)	(8)	3-13
3-13	SINE WAVE FILTER #2 BOARD Schematic and Layout	(124-000202)	(9)	3-14
3-14	SINE WAVE FILTER #3 BOARD SCHEMATIC AND LAYOUT	(124-000204)	(10)	3-15
3-15	UPPER MANUAL SYNTHESIS PERCUSSION BOARD Schematic and Layout	(124-000350)	(11)	3-16
3-16	REPEAT OSCILLATOR AND DETECTOR BOARD Schematic and Layout	(124-000353)	(12)	3-17
3-17	PEDAL FILTER BOARD	(124-000206)	(13)	3-18

LIST OF ILLUSTRATIONS CONTINUED

16,000 SERIES

FIGURE				PAGE
3-18	BRIGHT PERCUSSION FILTER BOARD Schematic, Layout, and Theory	(124-000208)	(14)	3-19
3-46	MIXER #2 BOARD Schematic, Layout, and Theory	(124-000376)	(15)	3-49
3-20	MIXER #3 BOARD Schematic, Layout, and Theory	(124-000377)	(16)	3-21
3-47	AUTO ACCOMPANIMENT BOARD Schematic, Layout, and Theory	(124-000424)	(17)	3-50
3-24	REVERBRATION BOARD - Schematic, Layout & Theory	(124-000166)		3-26
3-48	POWER SUPPLY ASSEMBLY - Schematic	(126-000117 thru 118)		3-51
3-49	POWER SUPPLY & AMPLIFIER ASSEMBLY WIRING DIAGRAM	(126-000117 thru 118)		3-52
3-27	35 WATT AMP BOARD - Schematic, Layout & Theory	(124-000169)		3-29
3-50	AUTO VARI-28 RHYTHM THEORY OF OPERATION			3-54
3-51	AUTO VARI -28 RHYTHM LOGIC DIAGRAM			3-55
3-52	AUTO VARI - 28 RHYTHM BOARD LAYOUT	(124-000430)		3-56
3-53	AUTO VARI - 28 RHYTHM BOARD SCHEMATIC	(124-000430)		3-57
3-54	AUTO VARI - 28 RHYTHM TRACKS & VARIATION CHART			3-58
3-55	CONTROL PANEL TAB SWITCH WIRING CHARTS			3-59
3-55	CHART OF ABBREVIATIONS CODE			3-59
3-56	PLUG AND PIN NUMBERS WIRING CHART See Figure 3-55 for Abbreviations Code	(P-1 THRU P-27)		3-60
3-57	PLUG AND PIN NUMBERS WIRING CHART See Figure 3-55 for Abbreviations Code	(P31 THRU P-80)		3-61
3-58	PLUG & PIN NUMBERS WIRING CHART See Figure 3-55 for Abbreviations Code	(P-83 THRU J-108U)		3-62
3-59	PLUG & PIN NUMBERS WIRING CHART See Figure 3-55 for Abbreviations Code	(J-108L THRU J-115U)		3-63
3-60	PLUG & PIN NUMBERS WIRING CHART See Figure 3-55 for Abbreviations Code	(J-115L THRU J-131)		3-64
3-61	PLUG & PIN NUMBER WIRING CHART See Figure 3-55 for Abbreviations Code	(J-141 THRU J-255)		3-65


UPPER MANUAL
UPPER MANUAL SIGNALS
MANUAL KEYING TERMINALS
380 DIVIDERS & KEYERS 124-000223-002
13 DAUGHTER BOARDS 124-000340
KEYER CUTOFF ADJUST
PEDAL KEYING TERMINALS
MDD OUTPUTS
SYNC
FROM J146
FROM J109, LOWER MAN.
J108
LOWER MANUAL
LOWER MANUAL SIGNALS
380 DIVIDERS & KEYERS 124-000223
13 DAUGHTER BOARDS 124-000341
FROM J110 U/M
TO J109 U/M
NOT USED
LOWER MANUAL SIGNALS
124-000201
PHASE INV. 124-000202
OUTPUT AMP Q14
124-000204
OCTAVE FILTERS
PEDAL SWITCH ASSEMBLY 120-000072
J125-7
PIZZICATO 2
BANJO TAB
J126-10
PIANO SOLO NO.
PIANO SOLO TAB
J104-7
J104-4
J104-20
J147-15
J147-12
J143-5



(SHEET 2)
094-049168-A, LOGIC SCHEMATIC DIAGRAM OF 16000 SERIES ORGAN

FIGURE 3-44
16,000 SERIES CONSOLE
LOGIC DIAGRAM
(SHEET 2 OF 2)

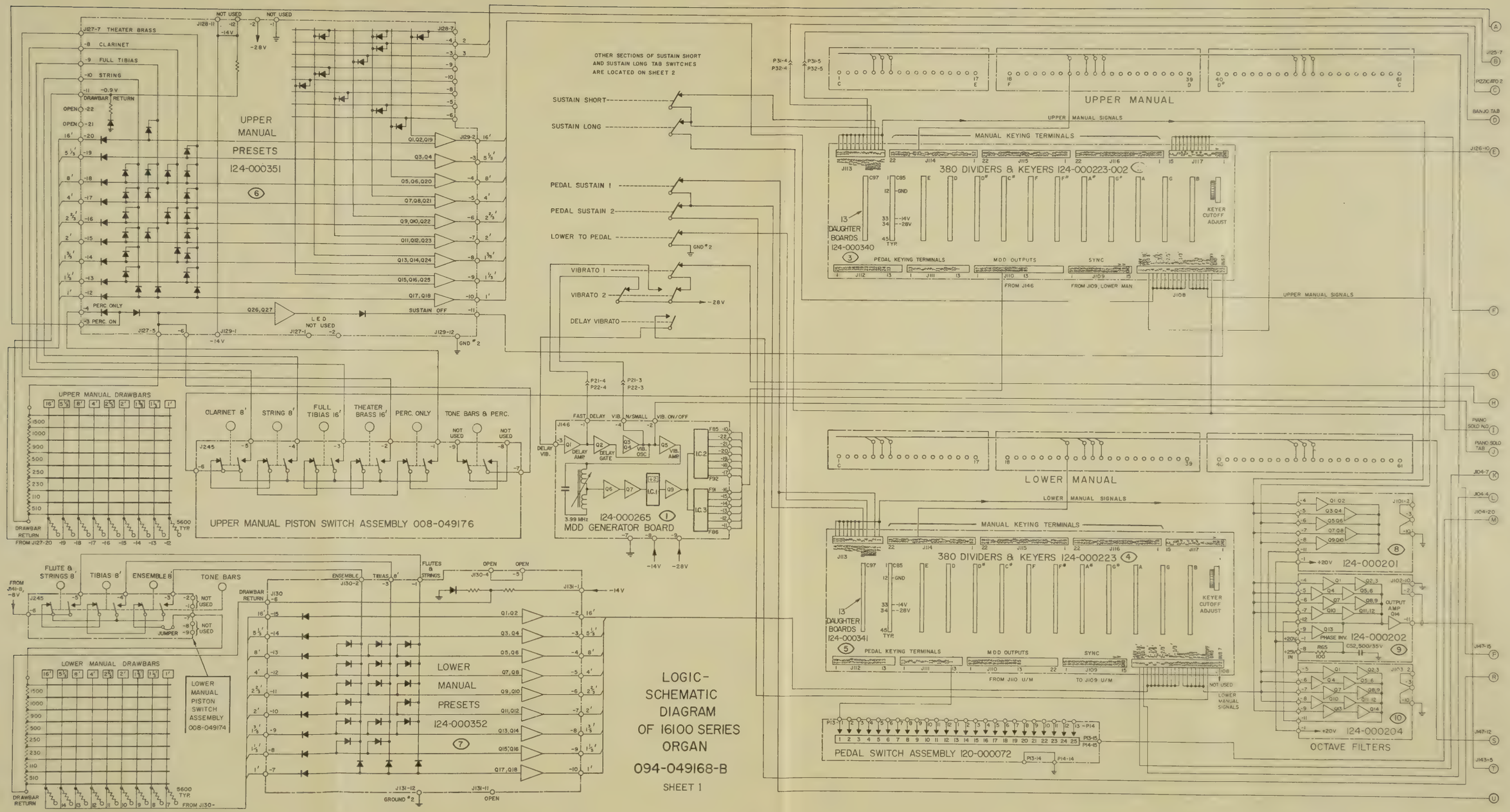
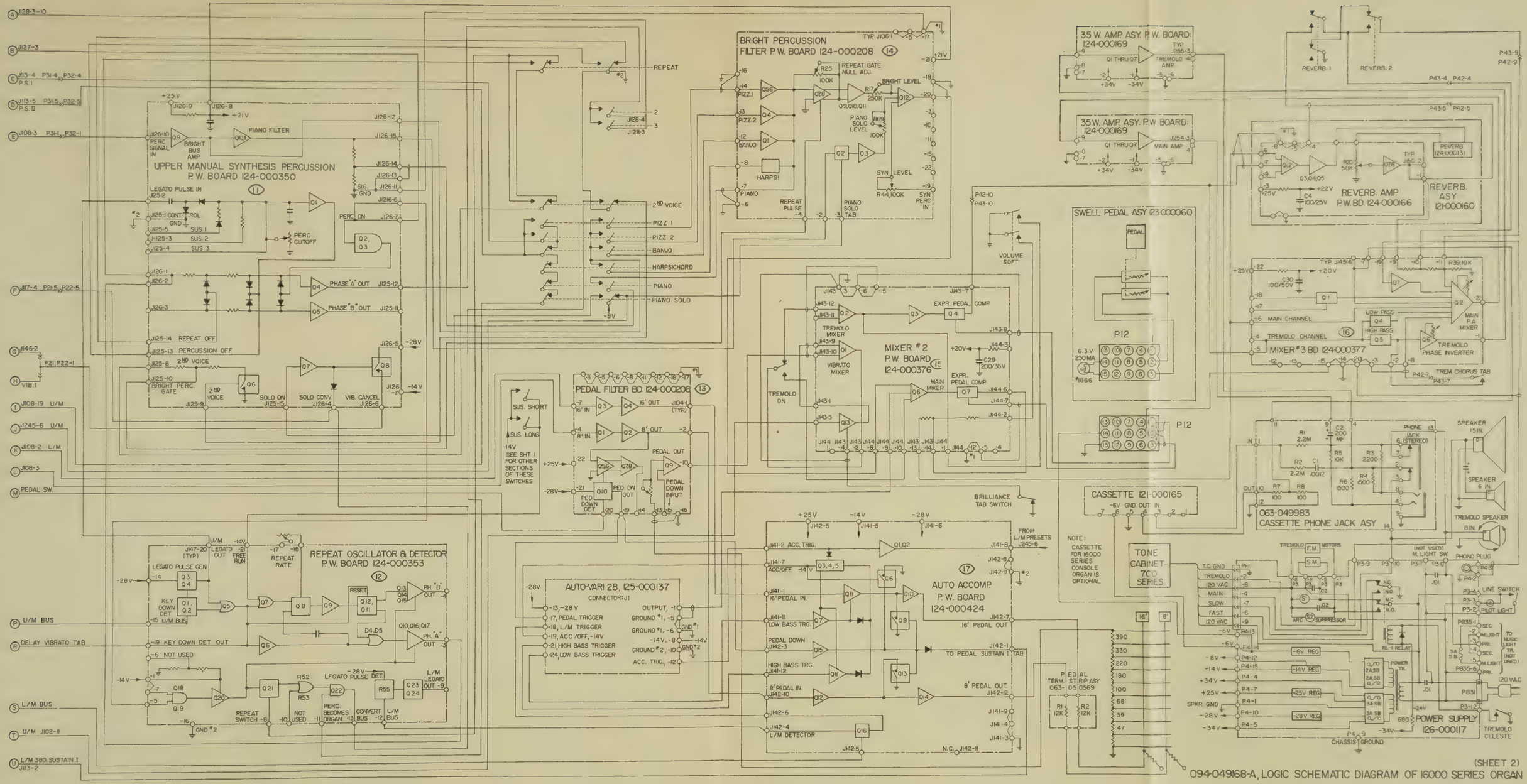
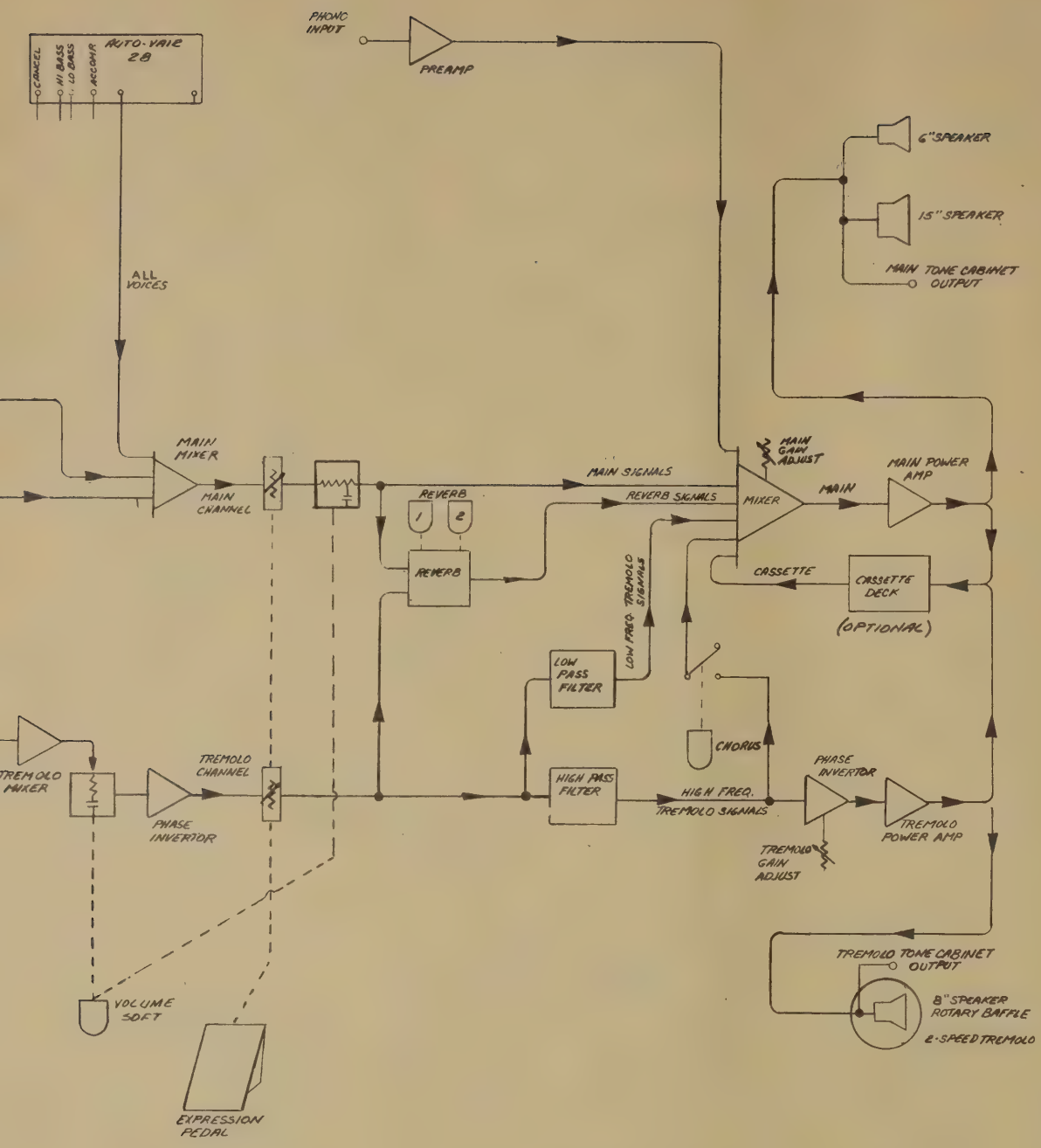


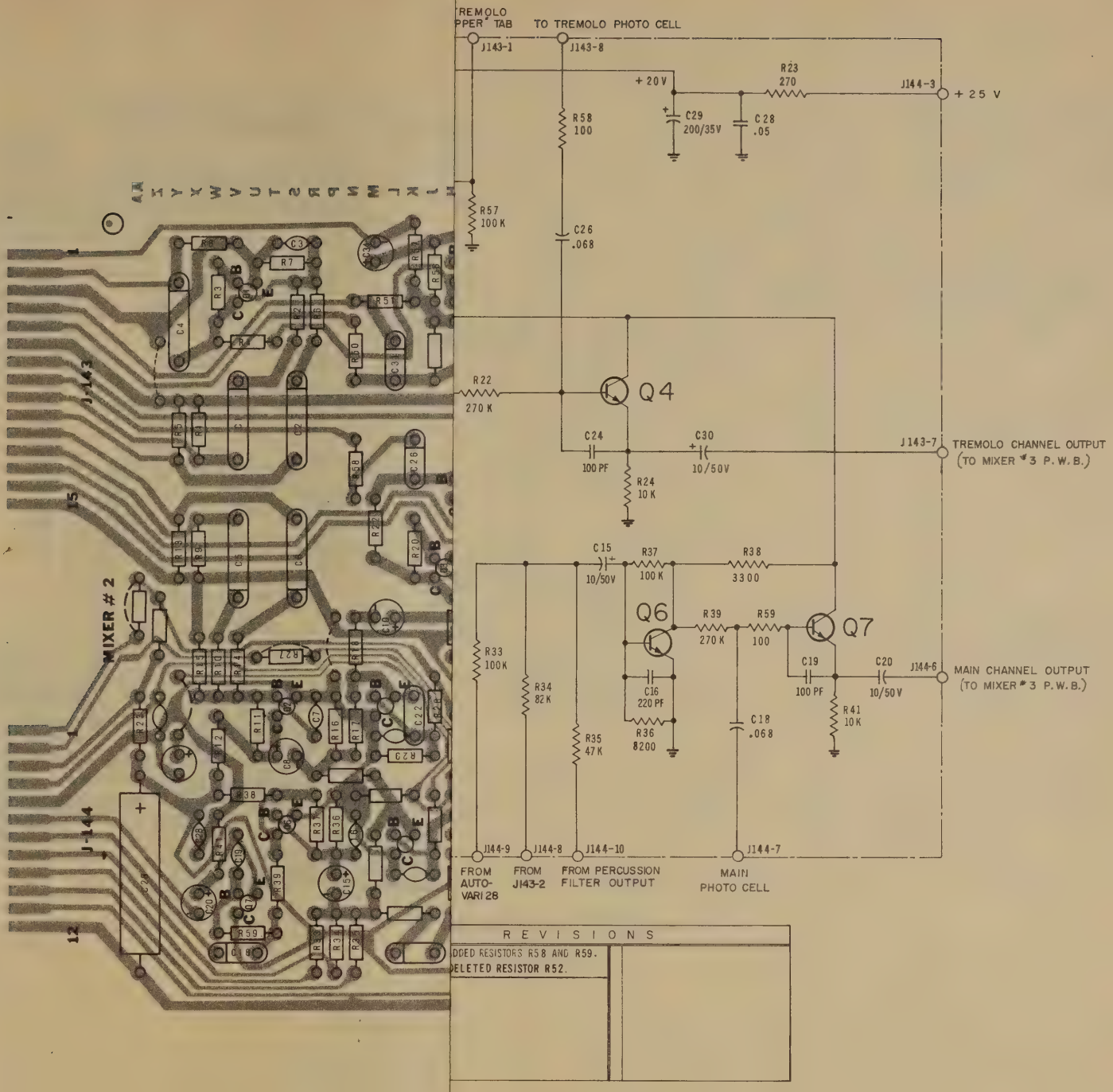
FIGURE 3-43
16,000 SERIES CONSOLE
LOGIC DIAGRAM
(SHEET 1 OF 2)



(SHEET 2)
094-049168-A, LOGIC SCHEMATIC DIAGRAM OF 16000 SERIES ORGAN

FIGURE 3-44
16,000 SERIES CONSOLE
LOGIC DIAGRAM
(SHEET 2 OF 2)


PHONO INPUT
PREAMP
AUTO-VAIR 28
CANCEL
HI BASS
LO BASS
ACCOMP
ALL VOICES
6" SPEAKER
15" SPEAKER
MAIN TONE CABINET OUTPUT
MAIN MIXER
MAIN CHANNEL
MAIN SIGNALS
REVERB SIGNALS
MAIN GAIN ADJUST
MIXER
MAIN
MAIN POWER AMP
REVERB
1
2
REVERB
CASSETTE
CASSETTE DECK
(OPTIONAL)
LOW FREQ. TREMOLO SIGNALS
LOW PASS FILTER
CHORUS
TREMOLO MIXER
TREMOLO CHANNEL
PHASE INVERTOR
HIGH PASS FILTER
HIGH FREQ. TREMOLO SIGNALS
PHASE INVERTOR
TREMOLO POWER AMP
TREMOLO GAIN ADJUST
TREMOLO TONE CABINET OUTPUT
8" SPEAKER ROTARY BAFFLE
2-SPEED TREMOLO
VOLUME SOFT
EXPRESSION PEDAL



124-000376 - MIXER #2 BOARD

Mixer PWB #2 (124-000376) is
pedal contouring for Main and
ing of upper and lower manual
ing of Percussion and Rhythm
channel. Volume soft for the
and Brilliance for the upper
located on this board.

Main Channel - The upper manu
J143-5 and Q13, an emitter fo
vides for Brilliance control
exits at J143-1 and is passed
J143-12 through the "Tremolo
organ. J143-9 and J-143-10 r
lower manual signals respecti
Tremolo tabs and apply them t
for "Main Channel" routing.
J143-2 are received and mixed

15

FIGURE 3-46
MIXER BOARD #2
SCHEMATIC, LAYOUT AND THEORY
(124-000376)

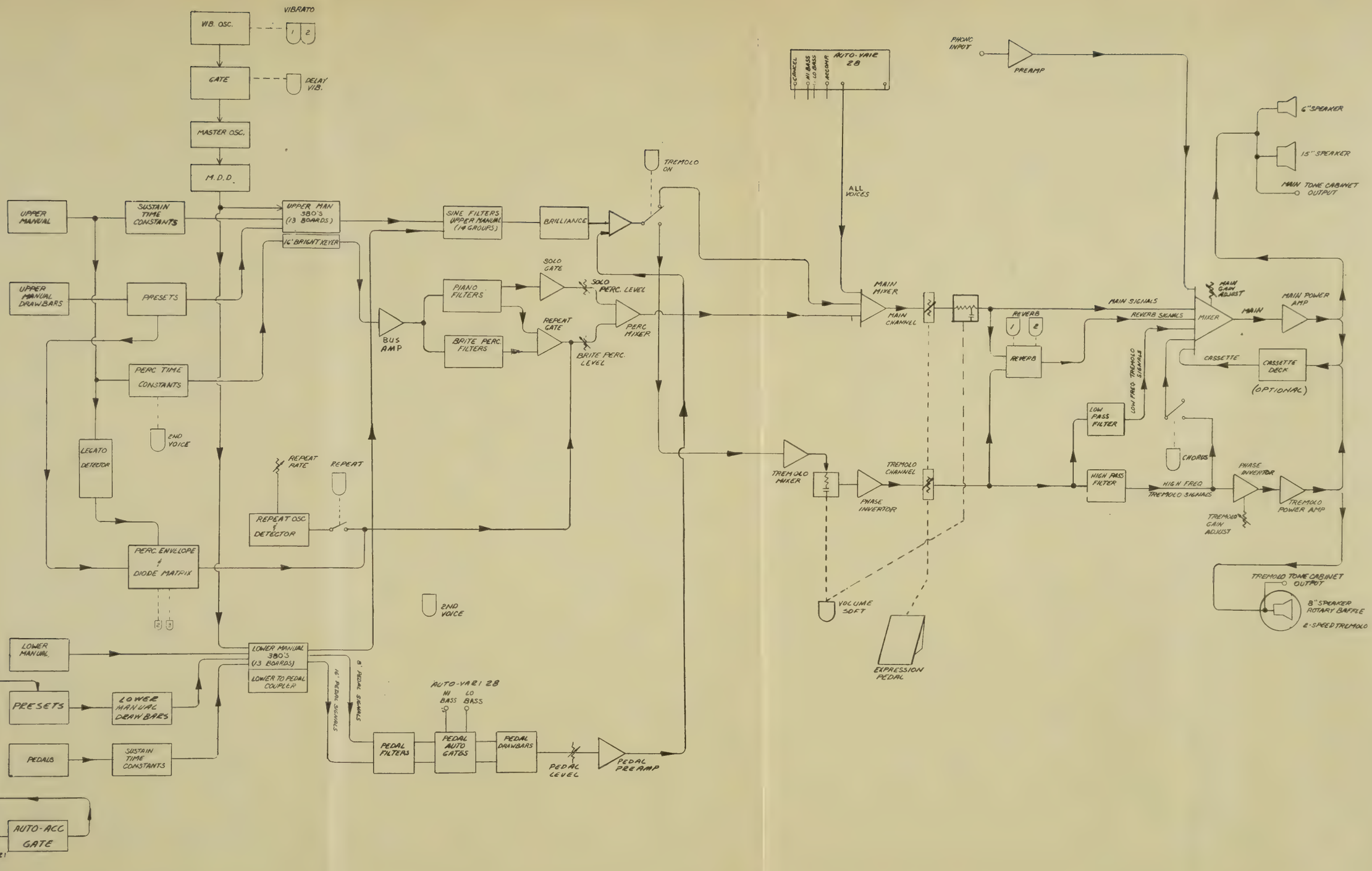
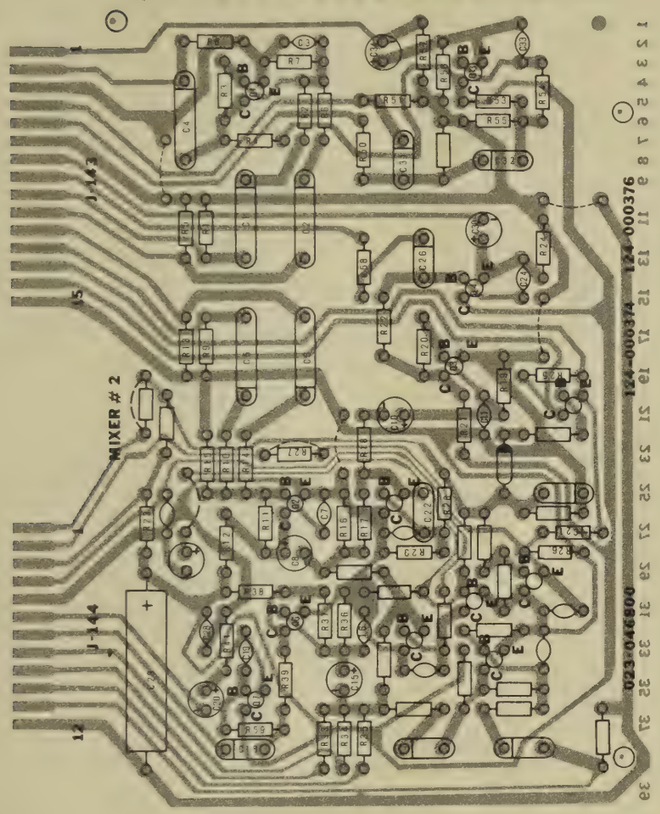
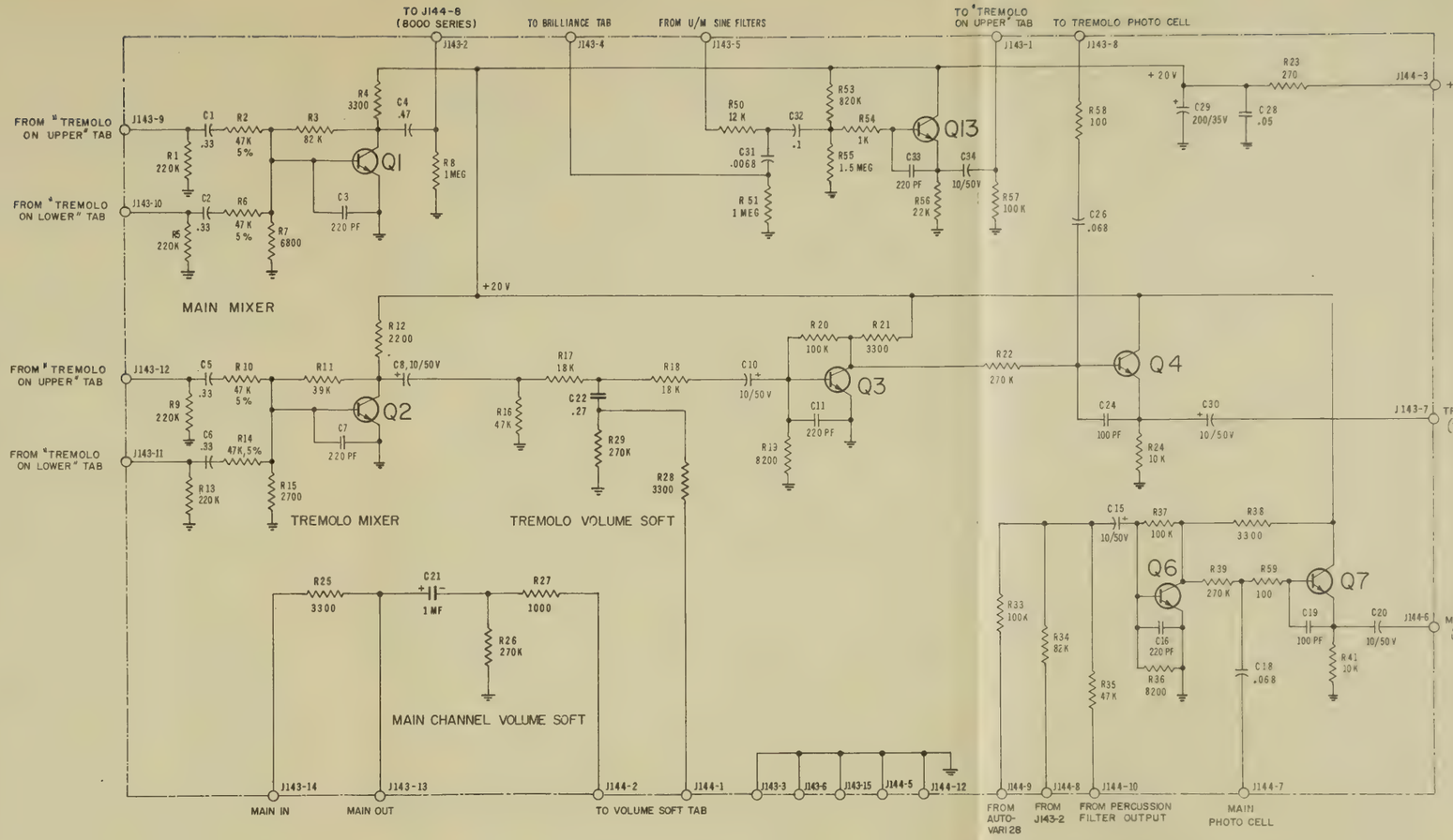


FIGURE 3-45
16,000 SERIES CONSOLE
BLOCK DIAGRAM





094-050378-A, SCHEMATIC DIAGRAM OF MIXER P. W. BD. # 2, 124-000376

REVISIONS		
A	ADDED RESISTORS R58 AND R59. DELETED RESISTOR R52.	

NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL ○ INDICATES PIN & IT'S NO. IN ONE OF 2 CONNECTORS.

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
7	Q1 THRU Q4, Q6, Q7, Q13	001-021135	2N3394

124-000376 - MIXER #2 BOARD

Mixer PWB #2 (124-000376) is used to provide swell pedal contouring for Main and Tremolo channels, mixing of upper and lower manuals into Tremolo, and mixing of Percussion and Rhythm channels into the Main channel. Volume soft for the Main and Tremolo channels and Brilliance for the upper manual circuits are also located on this board.

Main Channel - The upper manual signal is received at J143-5 and Q13, an emitter follower stage which provides for Brilliance control at J143-4. The signal exits at J143-1 and is passed either to J143-9 or J143-12 through the "Tremolo on Upper" tab in the organ. J143-9 and J-143-10 receive upper and/or lower manual signals respectively from the organ Tremolo tabs and apply them to C.E. Amplifier Q1 for "Main Channel" routing. At J144-8 signals from J143-2 are received and mixed with Rhythm signals entering at J144-9, and Percussion Filter signal entering at J144-10. C15 then couples these signals to the base of C.E. Amplifier Q6, through the collector to the base of Q7. The Swell Pedal photocell controls signal level from J144-7 by varying the impedance from that pin to ground. Series resistor R59 is used to dampen a tendency to oscillate due to external wire characteristics. Emitter follower Q7 then passes the signal out J144-6 and into J143-14, Main Channel volume soft circuit. When J144-2 is grounded, the voltage- divider action of R25 and C21, R27 provide frequency dependent roll off known as "Volume Soft: at J143-13.

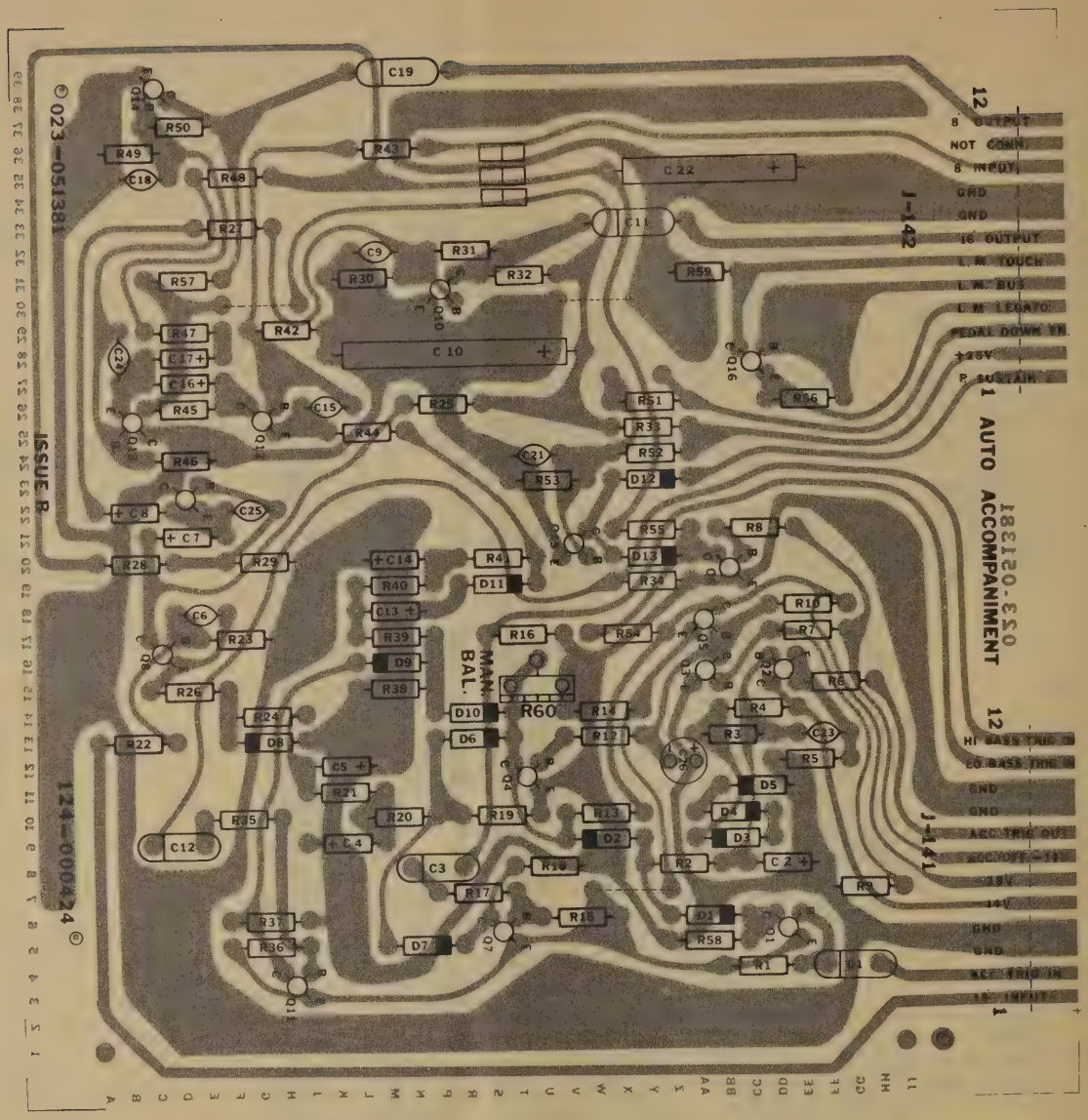
Tremolo Channel - Signal inputs for the Tremolo Channel arrive at J143-12 and/or J143-11 from the upper and lower Tremolo tabs respectively, through C.E. Amplifier. Q2 (Base to Collector, and through C8, R17 to the Tremolo Volume Soft. A ground applied to J144-1 provides a frequency dependent rolloff as in the Main Channel. The signal is then amplified by C. E. Amplifier. Q3, passes through emitter follower Q4, and exits at J143-7. Swell Pedal action at J143-8 is the same as described for Main Channel.

FIGURE 3-46
MIXER BOARD #2
SCHEMATIC, LAYOUT AND THEORY
(124-000376)

PART #	JEDEC PART #
4	2N 3394
72	2N 4249
35	2N 3394
73	2N 4249
260	2N 5826
080	IN 4148

N S

OHMS, 1/2 WATT, ±10%;
IN MICROFARADS.
O IT'S NUMBER ON
VO EDGE



NOTE:

EARLY PRODUCTION - 124-000360 BOARD

SEE PAGES 2-14 AND 2-15 FOR CIRCUIT CHANGES
UPDATING THE 124-000360 TO THE 124-000444

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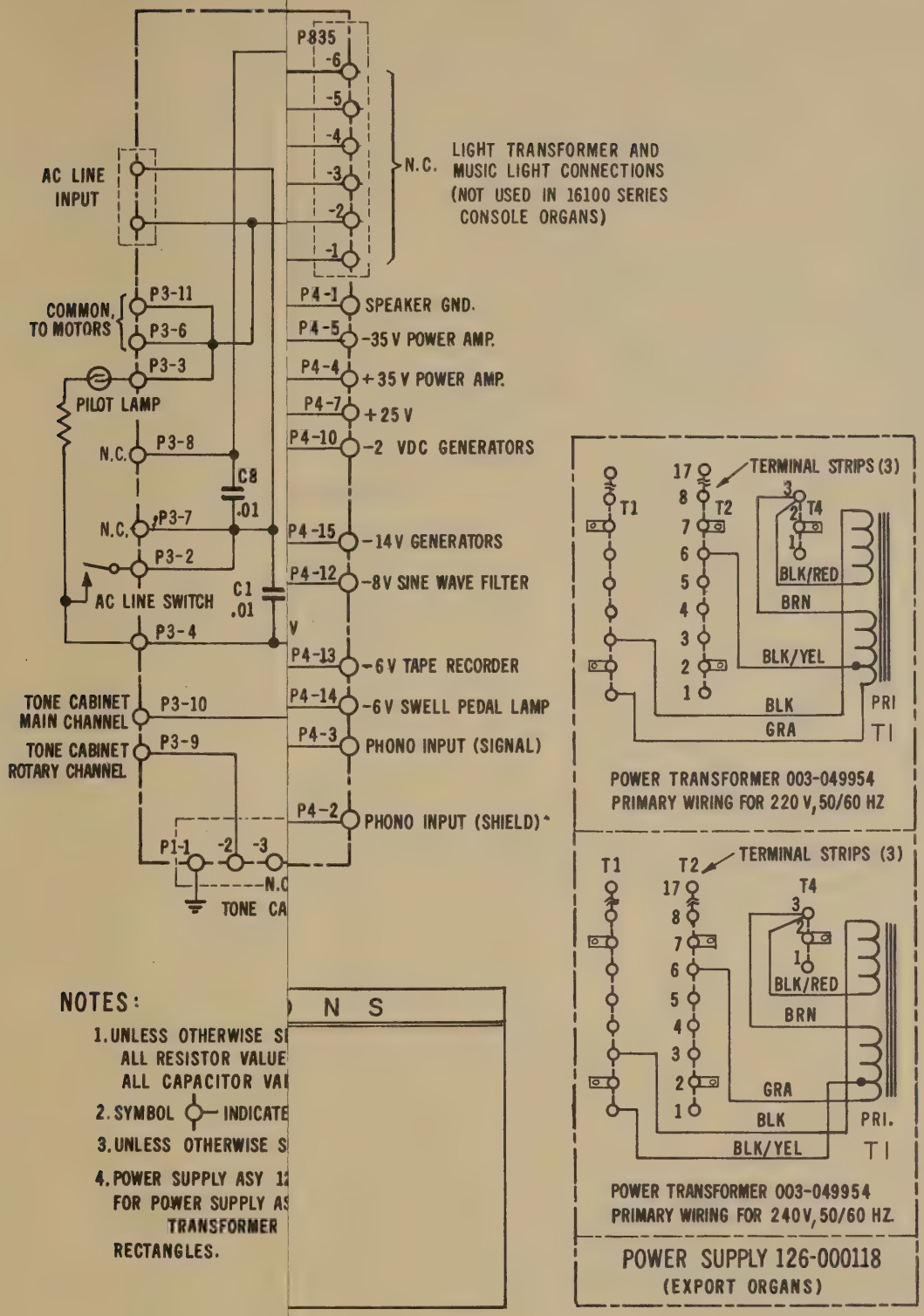
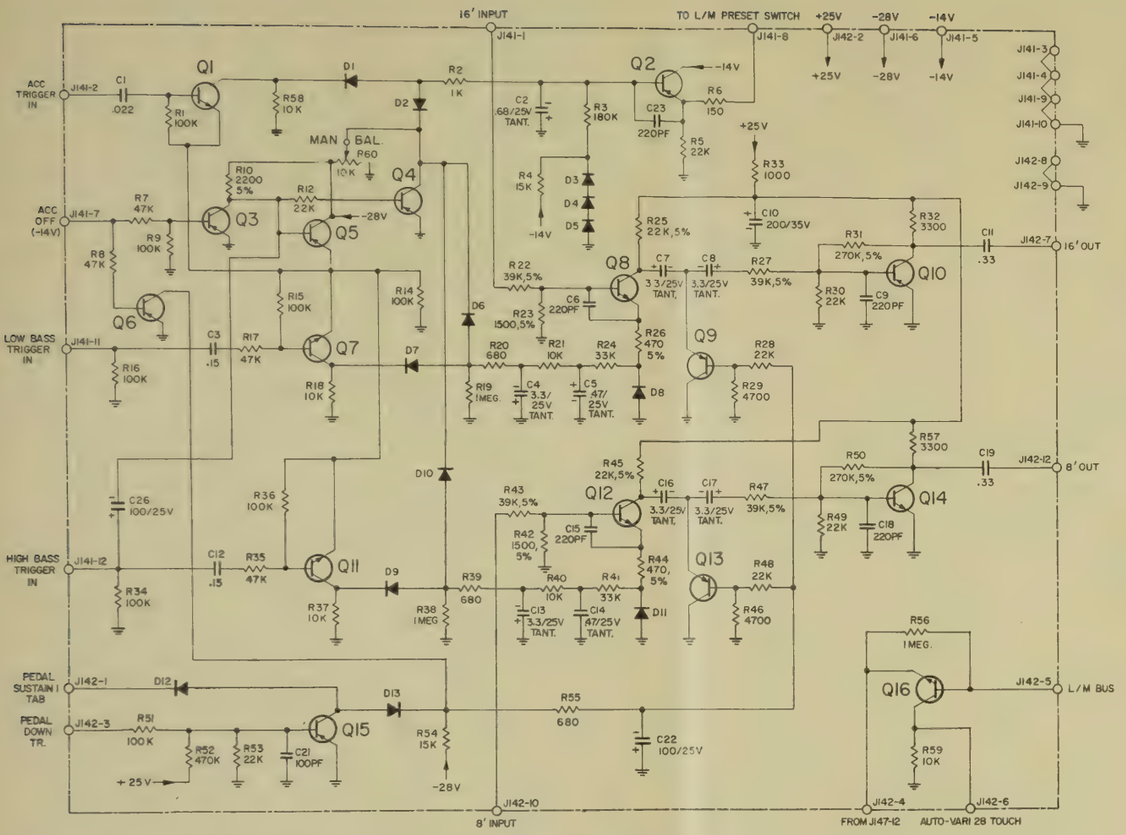


FIGURE 3-48
POWER SUPPLY ASSEMBLY SCHEMATIC
(126-000117 & 118)



AUTO ACCOMPANIMENT P.W. BOARD 124-000424

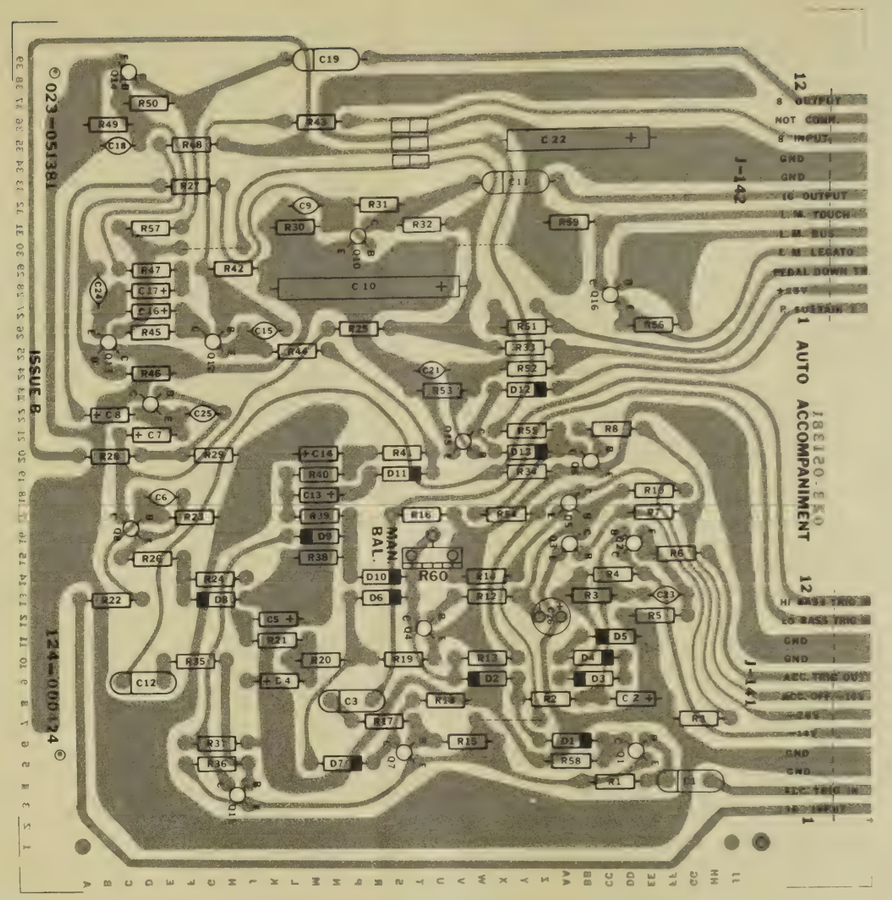
094-051385-C

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
4	Q1,Q7,Q11,Q16	001-021134	2N 3394
6	Q2,Q3,Q4,Q5,Q6,Q15	001-021172	2N 4249
2	Q8,Q12	001-021135	2N 3394
2	Q9,Q13	001-021173	2N 4249
2	Q10,Q14	001-021260	2N 5826
13	D1 THRU D13	001-026080	IN 4148

REVISIONS		
A	R29 & R46 WERE 10K. C20 DELETED.	
B	R11 & R13 DELETED. R60 ADDED.	
C	C22 WAS 10/50 V. C26 ADDED.	

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL ○— INDICATES PIN AND IT'S NUMBER ON P.W. BOARD AND IN ONE OF TWO EDGE CONNECTORS: J141 AND J142.



17

FIGURE 3-47
AUTO-ACCOMPANIMENT BOARD
SCHEMATIC, LAYOUT AND THEORY
(124-000424)

124-000424 AUTO ACCOMPANIMENT BOARD

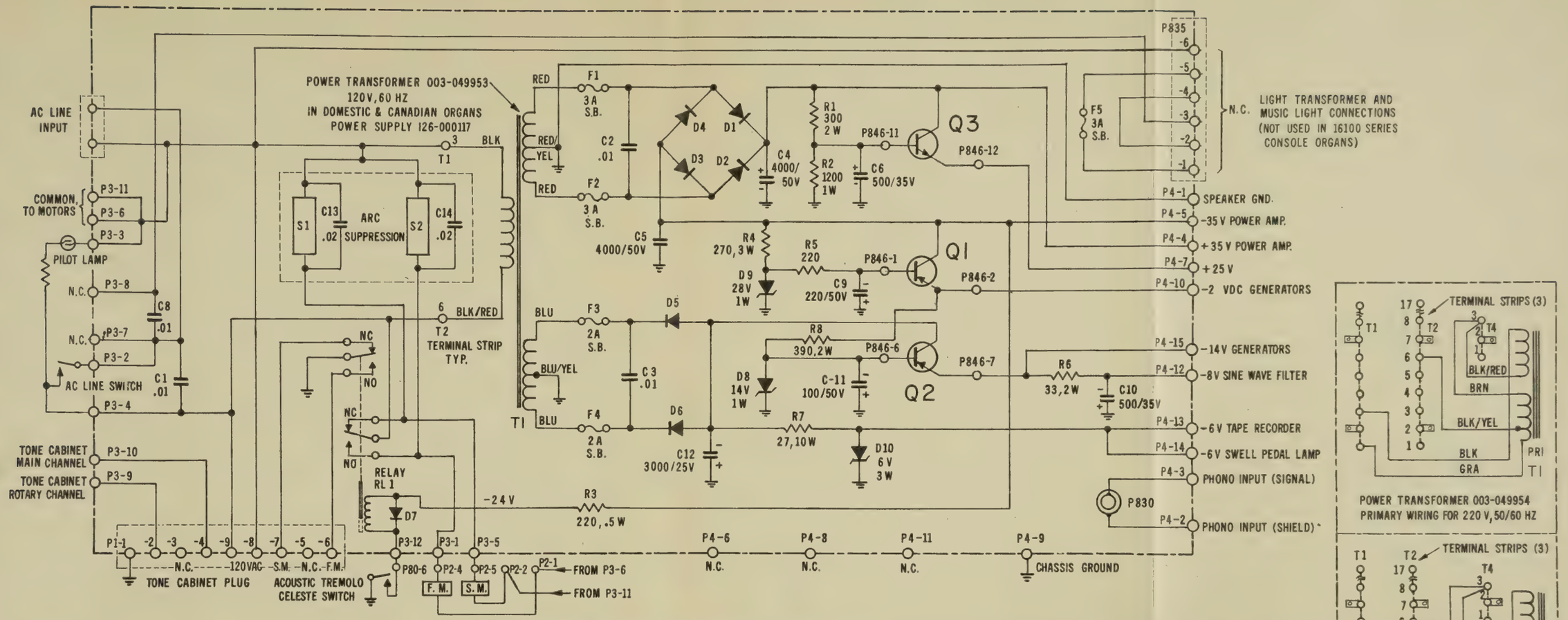
Auto Accompaniment PWB 124-000424 is used to provide Auto Accompaniment for the lower manual and pedals in response to triggers from Auto Vari 28 Rhythm Unit. Pedal snubbing and lower manual key down detector is also provided.

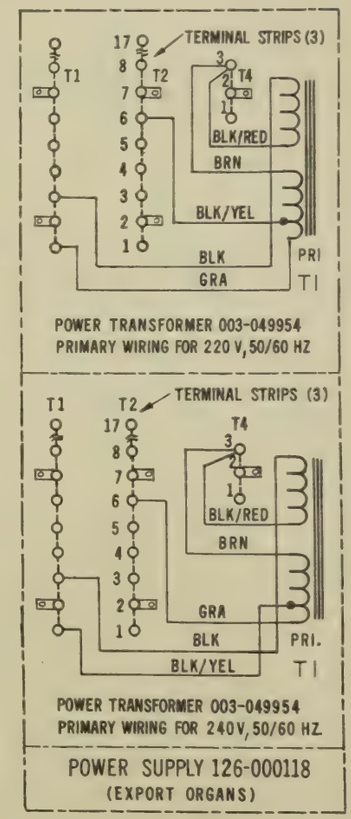
The lower manual circuitry provides D.C. control of the tonebar supply voltage only, lower manual signals do not enter the board.

NOTE:

EARLY PRODUCTION - 124-000360 BOARD

SEE PAGES 2-14 AND 2-15 FOR CIRCUIT CHANGES UPDATING THE 124-000360 TO THE 124-000444





NOTES:

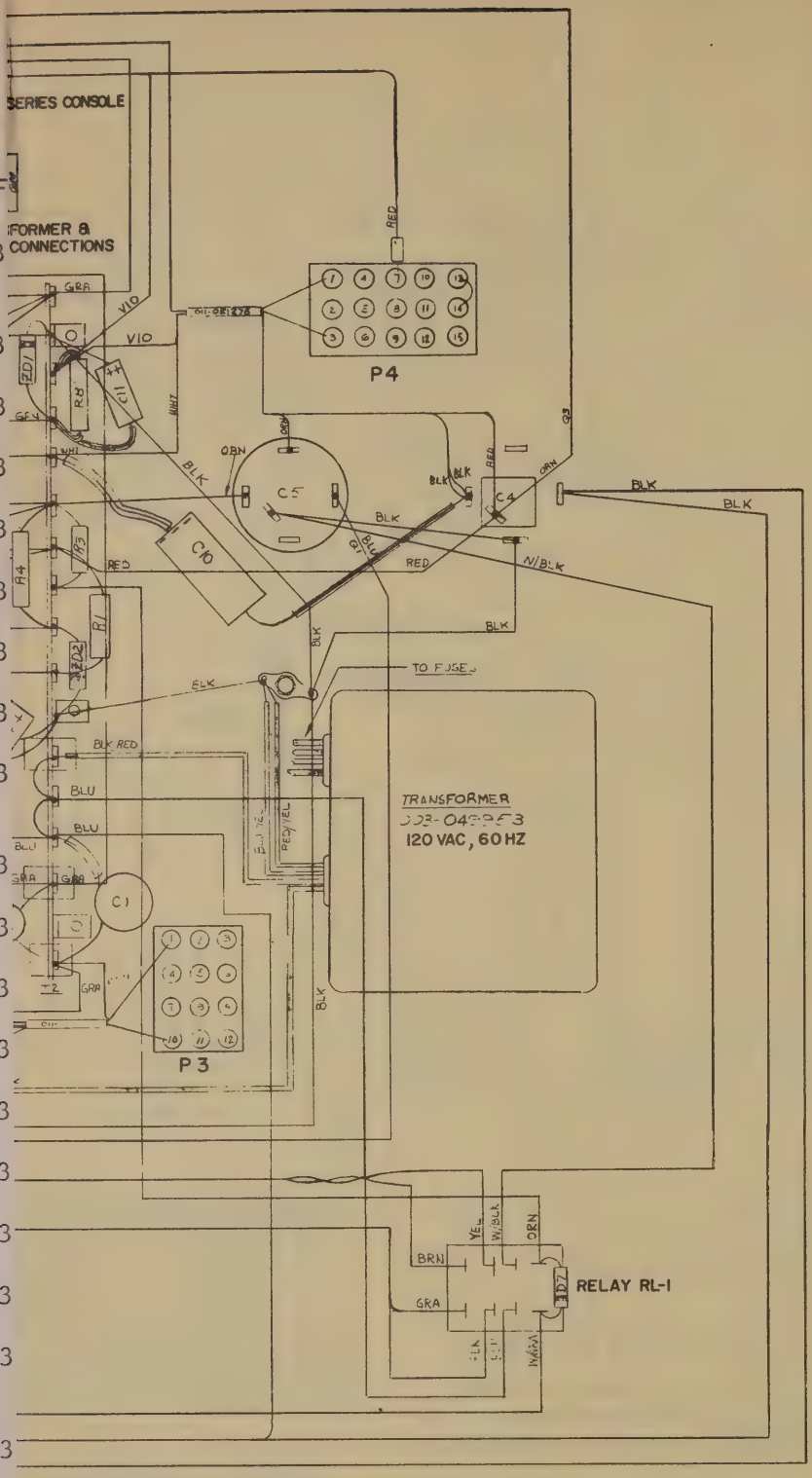
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10 % TOL;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL ⏀ INDICATES PIN & IT'S NO. IN PLUG OR CONNECTOR.
3. UNLESS OTHERWISE SHOWN, ALL SWITCHES ARE IN "OFF" POSITION.
4. POWER SUPPLY ASY 126-000117 (DOMESTIC & CANADA) AS SHOWN. FOR POWER SUPPLY ASY 126-000118 (EXPORT) SEE POWER TRANSFORMER PRIMARY WIRINGS, SHOWN AT RIGHT- IN DOTTED RECTANGLES.

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
2	Q1, Q2	001-022082	2N 6107
1	Q3	001-021322	2N 5298
6	D1 THRU D6	001-024061	1N 4720
1	D7	001-024052	1N 3189
1	D8 (ZENER, 14V, 1W)	001-023026	1N 4744
1	D9 (ZENER, 28V, 1W)	001-023027	1N 4750
1	D10 (ZENER, 6V, 3 W)	001-023043	1N 5340A

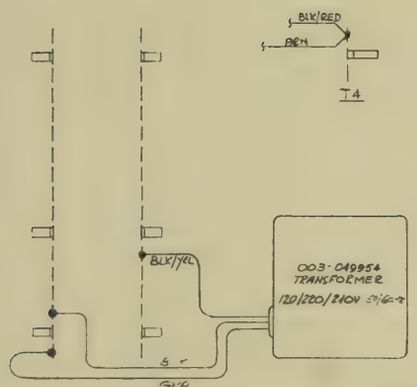
094-051286-A, SCHEMATIC DIAGRAM OF POWER SUPPLY 126-000117 & 126-000118
(FOR CONSOLE - 16100 USAGE)

REVISIONS		

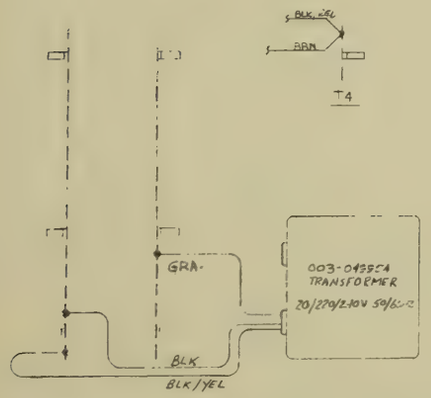
FIGURE 3-48
POWER SUPPLY ASSEMBLY SCHEMATIC
(126-000117 & 118)



126-000117/ 126-000118

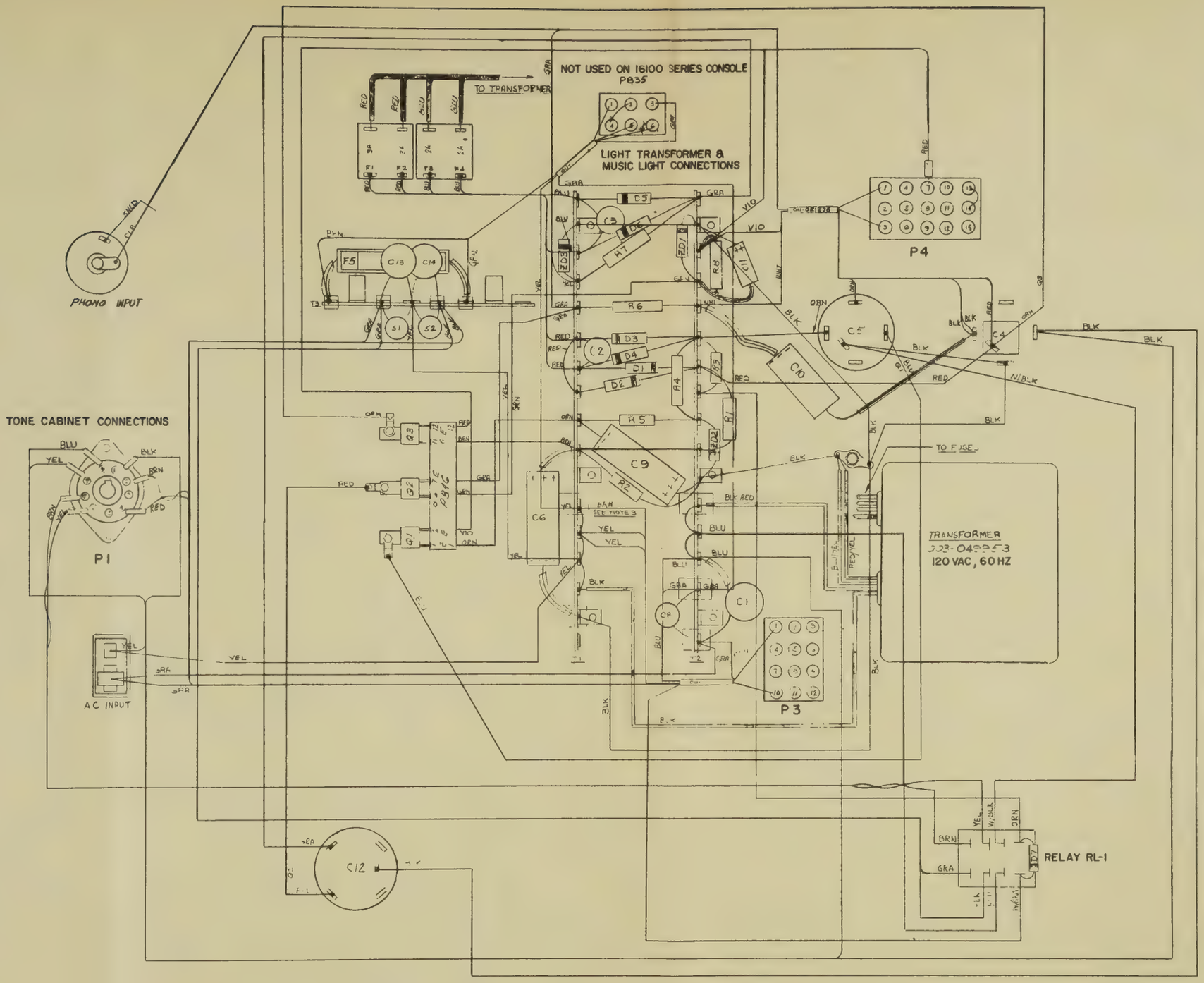


TRANSFORMER PRIMARY CONNECTIONS
126-000118 (220V 50/60 HZ)



TRANSFORMER PRIMARY CONNECTIONS
126-000118 (240V 50/60 HZ)

FIGURE 3-49
POWER SUPPLY AND AMPLIFIER
WIRING DIAGRAM



094-051252-C, WIRING DIAGRAM OF POWER SUPPLY 126-000117/126-000118
(16100 SERIES CONSOLE ORGAN USAGE)

NOTES:

1. 126-000117 WIRED AS SHOWN

2. POWER TRANSFORMER PRIMARY LEAD LOCATIONS ON 126-000118 DIFFER FROM 126-000117 SEE DETAIL VIEWS FOR CORRECT WIRING

AUTO VARI-28 THEORY OF OPERATION

RHYTHM START-STOP CIRCUITS

The Auto Vari-28 has seven (7) Rhythm Patterns, controlled by inter-locking buttons.

In order for the rhythm unit to operate, a negative voltage must be applied to at least one of the pattern select inputs of the "430" I.C., as selected by the rhythm pattern buttons.

There are three (3) modes of operation available: touch, *synchro-start, and continuous. They are selected by inter-locking push buttons.

If the "Continuous" button is depressed, -14 V is applied through R13 and R14 to the base of Q4, turning it "ON". OV at the collector of Q4 is applied through R12 to the base of Q5, turning it "OFF". The collector of Q5 goes to -14V,which is buffered by Q6 and developed across R21. The minus voltage across R21 enables the rhythm select switches.

If the "Touch" button is depressed, operation is as with the "Continuous" button depressed, but instead of turning transistor Q4 "ON" with a constant -14V, -28V is applied to D7 or D8 by depressing a key or pedal. This voltage turns Q4 "ON" through R16, as long as the key or pedal is held down.

In "Synchro-Start" mode, applying -28V to D7 or D8 turns "ON" Q4 as in "Touch" mode. When Q5 goes "OFF", -14V feeds back from the collector of Q5 to R14, holding Q4 "ON" even after the key or pedal is released. The rhythm is turned "OFF" only by putting the "Silent/Sound" switch in the "Silent" position.

Any time that the "Silent/Sound" switch is in the "Silent" position, all three modes of operation are cancelled by the ground applied to R14 through D9.

CLOCK GENERATOR

A P.U.T. oscillator is used to provide the clock for the "430" I.C. It operates as follows:

The gate of Q13 is held at approximately -4 volts by R57 and R59. C10, connected to the anode of Q13 is charged through R55 and the "Tempo" pot toward ground. When the anode voltage exceeds the gate voltage by more than a threshold of about 1 volt, Q13 will turn "ON", discharging C10 through R56, and the process starts over. The charging rate for C10 is determined by the setting of the "Tempo" pot.

Q14 is turned "ON" by the voltage developed across R56 by the discharge of C10 through Q13. The collector of Q14 goes to -14V, which is applied through R61 to the clock input of the "430" I.C. Q14 is typically "ON" for about 50 MS, the time required to discharge C10. Therefore, the clock pulse at the "430" I.C. is very short in duration.

* SYNCHRO-START IS THE SAME AS TOUCH-START

The "430" I.C. must also be reset when the rhythm unit is turned "ON". The minus voltage applied to the rhythm pattern switches to enable the I.C. is also differentiated by C2 and R7 and resets the I.C. through D6.

RHYTHM "430" I.C.

The "430" I.C. is enabled by the application of a minus voltage to one of its pattern select inputs. Its rate is determined by the frequency of the pulse train applied to the clock input.

For a given enabled pattern, the "430" I.C. provides trigger pulses to the rhythm voice generators at a rate determined by the clock frequency. The trigger pulses are positive going, from -14V to OV, and are about 65 MS in duration.

Also provided by the "430" I.C. are outputs, -14V square waves, corresponding to .25, .5, 1, 2, and 4 measure intervals. These are used to control the Y2 and Y3 inputs of the I.C., which select pattern variations. The variation operation will be described later.

The voice trigger and measure information outputs are tied resistively to -14V since they do not have internal pull-down resistances.

VOICE GENERATORS

The snare drum low frequency, clave, conga, bass drum, and bongo generators are essentially identical except for component values. For this reason only the snare drum low frequency generator will be described.

Q20 is set up as a phase shift oscillator. It normally is biased "OFF". When the positive going pulse from the "430" I.C. is applied to the base of Q20, the transistor is biased "ON" and begins oscillation. The oscillation frequency is determined primarily by R96, R97, C22, C23 and C24.

The decay envelope of the oscillation is controlled by C20, R93, C21, R94 and R95. D27 prevents turn-off of the transistor by the falling edge of the trigger pulse.

I.C. 3 is a white noise source. A -14V (p-p) noise signal is present at pin 3. After suitable attenuation by R82 and R92, the noise is used for the cymbal, brush, and snare drum high frequency generators.

The brush and cymbal are identical except for the duration of the decay envelope. The white noise across R82 is applied to the base of Q21 through R106 and C33. Q21 is normally biased "OFF", and is turned "ON" by the "430" I.C. brush and cymbal trigger pulses.

C27 through R103 shape the decay envelope for the brush voice. C27 is driven by the voice trigger pulse from the "430" I.C. C26 prevents chip noise from triggering the voice.

C31 through R104 and R108 shape the decay envelope for the cymbal voice. The envelope has a dual time constant. C30 prevents noise from triggering the voice.

C35 and L1, in the collector circuit of Q21, are a band-pass filter for the white noise, used to add authenticity to the brush and cymbal voices.

Q23 is triggered by the snare drum trigger from the "430" I.C. The trigger pulse through D31 turns Q23 "ON", resulting in amplification of the white noise applied to the base of Q23 through R118 and C40. The amplified white noise, filtered by C41 and C42, adds to the snare drum low frequency component from Q20.

All of the voices are mixed into Q22, the voicing pre-amp. The output from Q22 is attenuated by the "Rhythm Volume" control and fed to the organ pre-amps. Two additional outputs are available. One with high frequency roll-off and one with high frequency boost, for use in organs requiring such contouring.

AUTO VARI MEASURE SELECTION AND MEASURE LIGHTS

The variation of the rhythm pattern to be played is selected by the voltages applied to pins 18 and 19 of the "430" I.C., the Y2 and Y3 inputs. The outputs of the two D-flip-flops contained in I.C. 2 (075-000100) are used to control the Y2 and Y3 inputs. The outputs of the flip-flops are pins 1 and 13.

In Auto Vari mode the clock input of the first flip-flop (pin 3) is connected to the .5, 1, 2 or 4 measure output of the "430" I.C. through the "Measure Select" switch and D25. Since the Q1 output of the flip-flop is fed back to the D1 input, Q1 will toggle at half of the clock frequency. Q1 will then change every .5, 1, 2, or 4 measures. Q1 controls the Y2 input of the "430" I.C. The second flip-flop functions in the same way, and controls the Y3 input of the "430" I.C. The changing Y2 and Y3 inputs cause the "430" I.C. to play the four variations sequentially.

The Q1, $\overline{Q1}$, Q2, and $\overline{Q2}$ outputs of the flip-flops also drive D20 through D23 and R65, R67, R69 and R71. These diodes and resistors turn Q15 through Q18 "ON", one for each variation selected, and the transistors drive the variation indicator lights. For example, in variation "A" Q1 and Q2 are both at OV. Q2 applies negative bias to Q18, turning it "ON". Q1 back biases D20. Q18, therefore, drives the "A" variation light, turning it "ON".

Resistors R62 and R63 are a voltage divider providing -10V for the flip-flop I.C. power supply.

Q12 is turned "ON" by the pulse which resets the "430" I.C., and thereby resets the flip-flop stages to variation "A", if the "Auto Vari" switch is "ON" and the rhythm is reset.

TEMPO LAMP

If the rhythm is not running, the X3 (1 cycle/1/4 measure) pulse triggers Q1 and Q2 "ON" through C1 and R45. D5 prevents C1 from being charged by the falling edge which appears across R4 when X3 goes negative. Q1 and Q2 drive the tempo lamp "ON".

If the rhythm unit is running, Q6 is "ON" and applies -14V to D2, preventing the X3 pulses from passing through D4 to C1. At the same time Q3 turns "OFF", applying OV to D1, allowing the X5 pulses (1 cycle/measure) to pass through D3 to C1. The tempo lamp now flashes once per measure rather than once per beat.

ORGAN CONTROL CIRCUITRY

Q7 is used for control of external circuitry in the organ.

If the "Silent/Sound" switch is in the "Sound" position and the "Autochord" button is depressed, J1-7 is at OV and Q7 is "OFF", putting -28V on J1-4. Otherwise J1-7 is at -14V and J1-4 is at OV due to Q7 being "ON".

ACCOMPANIMENT TRIGGER

Positive going pulses from pin 39 of the "430" I.C. are fed from J2-12 to the Autochord circuits of some organs, if the "Silent/Sound" switch is in the "Sound"position and the autochord button is depressed. Otherwise D12 holds J2-11 at -14V.

The pulses from the "430" I.C. also trigger Q8 "ON". C7, R36, R37 and R38 provide a decaying voltage through D12 to control autochord circuits in some organs.

PEDAL TRIGGERS

On the first beat of every measure, when X5 goes positive, Q10 is turned "ON" applying OV to J1-12, which triggers low bass. At the same time Q11 is turned "ON".

When the "Waltz" button is depressed, the low bass is triggered every other measure, since X5 is replaced by Y1 through the "Waltz" switch.

When X5 (Y1 on "Waltz") goes negative, Q10 is turned "OFF" and Q11 is turned "OFF". This puts OV on J1-9, and decaying waveform at J1-10, controlling high bass.

When the rhythm is first turned "ON", C4, R26, and D18 trigger the low bass once, since there is no transition of Q10 (caused by the "430" chip) to provide a pulse through C8 and D16.

If the "Autochord" button is not depressed or the "Silent/Sound" switch is in the "Silent" position, D15 cancels low bass pulses and D17 cancels the first low bass pulse. In addition Q9 turns on, putting +15V on J1-10 which holds some spinets in high bass mode.

FIGURE 3-50
AUTO VARI - 28 RHYTHM UNIT
THEORY OF OPERATION

OF OPERATION

through R103 shape the decay envelope for the brush
e. C27 is driven by the voice trigger pulse from
"430" I.C. C26 prevents chip noise from triggering
voice.

through R104 and R108 shape the decay envelope for
cymbal voice. The envelope has a dual time con-
t. C30 prevents noise from triggering the voice.

and L1, in the collector circuit of Q21, are a
-pass filter for the white noise, used to add auth-
city to the brush and cymbal voices.

is triggered by the snare drum trigger from the "430"
The trigger pulse through D31 turns Q23 "ON", re-
ing in amplification of the white noise applied to
base of Q23 through R118 and C40. The amplified
e noise, filtered by C41 and C42, adds to the snare
low frequency component from Q20.

of the voices are mixed into Q22, the voicing pre-amp.
output from Q22 is attenuated by the "Rhythm Volume"
rol and fed to the organ pre-amps. Two additional
uts are available. One with high frequency roll-off
one with high frequency boost, for use in organs re-
ing such contouring.

VARI MEASURE SELECTION AND MEASURE LIGHTS

variation of the rhythm pattern to be played is sel-
d by the voltages applied to pins 18 and 19 of the
" I.C., the Y2 and Y3 inputs. The outputs of the
D-flip-flops contained in I.C. 2 (075-000100) are
to control the Y2 and Y3 inputs. The outputs of
flip-flops are pins 1 and 13.

uto Vari mode the clock input of the first flip-flop
3) is connected to the .5, 1, 2 or 4 measure output
he "430" I.C. through the "Measure Select" switch and
Since the Q1 output of the flip-flop is fed back to
D1 input, Q1 will toggle at half of the clock frequency.
vill then change every .5, 1, 2, or 4 measures. Q1 con-
ls the Y2 input of the "430" I.C. The second flip-flop
tions in the same way, and controls the Y3 input of the
" I.C. The changing Y2 and Y3 inputs cause the "430"
to play the four variations sequentially.

Q1, $\overline{Q1}$, Q2, and $\overline{Q2}$ outputs of the flip-flops also drive
through D23 and R65, R67, R69 and R71. These diodes
resistors turn Q15 through Q18 "ON", one for each varia-
n selected, and the transistors drive the variation in-
ator lights. For example, in variation "A" Q1 and Q2
both at 0V. Q2 applies negative bias to Q18, turning
"ON". Q1 back biases D20. Q18, therefore, drives
"A" variation light, turning it "ON".

istors R62 and R63 are a voltage divider providing -10V
the flip-flop I.C. power supply.

is turned "ON" by the pulse which resets the "430" I.C.,
thereby resets the flip-flop stages to variation "A",
the "Auto Vari" switch is "ON" and the rhythm is reset.

TEMPO LAMP

If the rhythm is not running, the X3 (1 cycle/1/4 measure) pulse triggers Q1 and Q2 "ON" through C1 and R45. D5 prevents C1 from being charged by the falling edge which appears across R4 when X3 goes negative. Q1 and Q2 drive the tempo lamp "ON".

If the rhythm unit is running, Q6 is "ON" and applies -14V to D2, preventing the X3 pulses from passing through D4 to C1. At the same time Q3 turns "OFF", applying 0V to D1, allowing the X5 pulses (1 cycle/measure) to pass through D3 to C1. The tempo lamp now flashes once per measure rather than once per beat.

ORGAN CONTROL CIRCUITRY

Q7 is used for control of external circuitry in the organ.

If the "Silent/Sound" switch is in the "Sound" position and the "Autochord" button is depressed, J1-7 is at 0V and Q7 is "OFF", putting -28V on J1-4. Otherwise J1-7 is at -14V and J1-4 is at 0V due to Q7 being "ON".

ACCOMPANIMENT TRIGGER

Positive going pulses from pin 39 of the "430" I.C. are fed from J2-12 to the Autochord circuits of some organs, if the "Silent/Sound" switch is in the "Sound"position and the autochord button is depressed. Otherwise D12 holds J2-11 at -14V.

The pulses from the "430" I.C. also trigger Q8 "ON". C7, R36, R37 and R38 provide a decaying voltage through D12 to control autochord circuits in some organs.

PEDAL TRIGGERS

On the first beat of every measure, when X5 goes positive, Q10 is turned "ON" applying 0V to J1-12, which triggers low bass. At the same time Q11 is turned "ON".

When the "Waltz" button is depressed, the low bass is triggered every other measure, since X5 is replaced by Y1 through the "Waltz" switch.

When X5 (Y1 on "Waltz") goes negative, Q10 is turned "OFF" and Q11 is turned "OFF". This puts 0V on J1-9, and decaying waveform at J1-10, controlling high bass.

When the rhythm is first turned "ON", C4, R26, and D18 trigger the low bass once, since there is no transition of Q10 (caused by the "430" chip) to provide a pulse through C8 and D16.

If the "Autochord" button is not depressed or the "Silent/Sound" switch is in the "Silent" position, D15 cancels low bass pulses and D17 cancels the first low bass pulse. In addition Q9 turns on, putting +15V on J1-10 which holds some spinets in high bass mode.

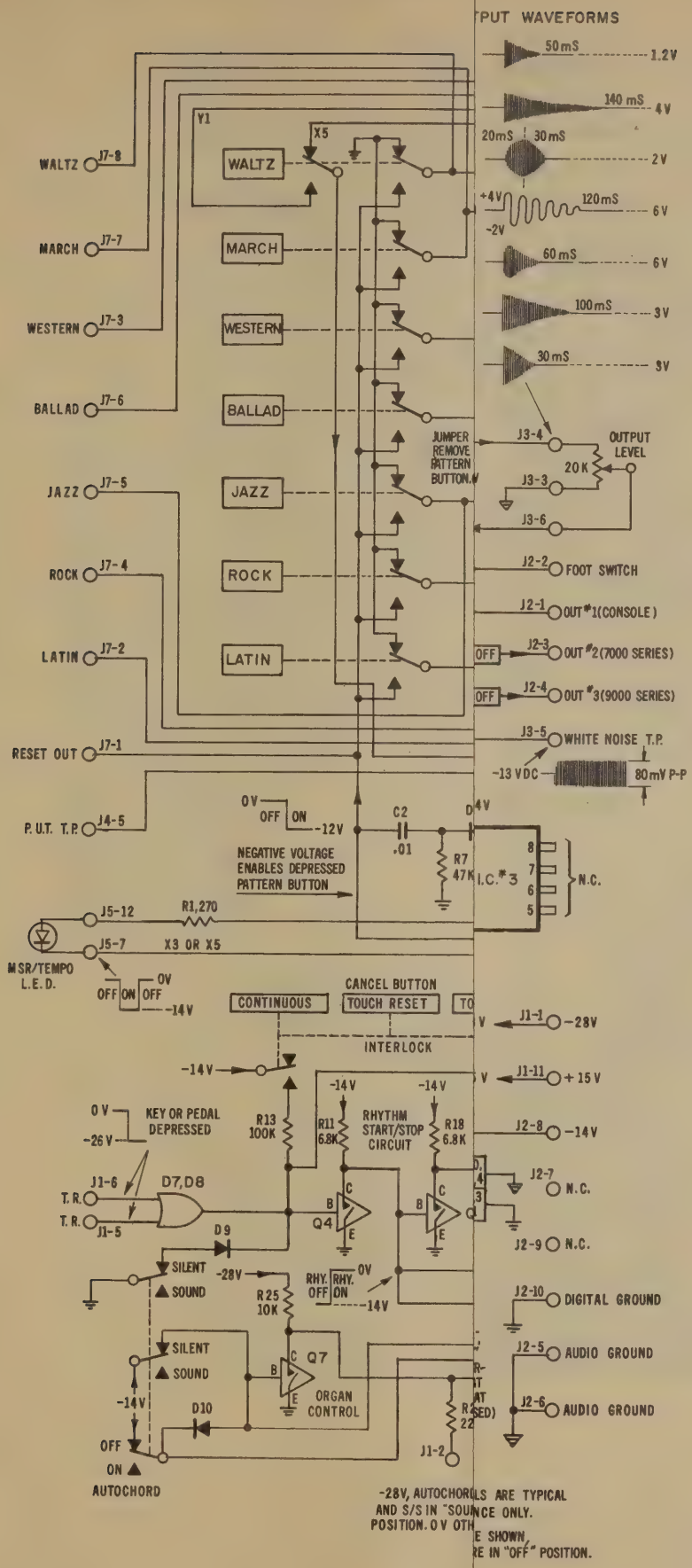


FIGURE 3-51
AUTO VARI - 28 RHYTHM
UNIT LOGIC DIAGRAM

OF OPERATION

through R103 shape the decay envelope for the brush
e. C27 is driven by the voice trigger pulse from
"430" I.C. C26 prevents chip noise from triggering
voice.

through R104 and R108 shape the decay envelope for
cymbal voice. The envelope has a dual time con-
t. C30 prevents noise from triggering the voice.

and L1, in the collector circuit of Q21, are a
-pass filter for the white noise, used to add auth-
city to the brush and cymbal voices.

is triggered by the snare drum trigger from the "430"
The trigger pulse through D31 turns Q23 "ON", re-
ing in amplification of the white noise applied to
base of Q23 through R118 and C40. The amplified
e noise, filtered by C41 and C42, adds to the snare
low frequency component from Q20.

of the voices are mixed into Q22, the voicing pre-amp.
output from Q22 is attenuated by the "Rhythm Volume"
rol and fed to the organ pre-amps. Two additional
uts are available. One with high frequency roll-off
one with high frequency boost, for use in organs re-
ing such contouring.

VARI MEASURE SELECTION AND MEASURE LIGHTS

variation of the rhythm pattern to be played is sel-
d by the voltages applied to pins 18 and 19 of the
)" I.C., the Y2 and Y3 inputs. The outputs of the
D-flip-flops contained in I.C. 2 (075-000100) are
l to control the Y2 and Y3 inputs. The outputs of
-flip-flops are pins 1 and 13.

uto Vari mode the clock input of the first flip-flop
3) is connected to the .5, 1, 2 or 4 measure output
he "430" I.C. through the "Measure Select" switch and
Since the Q1 output of the flip-flop is fed back to
D1 input, Q1 will toggle at half of the clock frequency.
ill then change every .5, 1, 2, or 4 measures. Q1 con-
ls the Y2 input of the "430" I.C. The second flip-flop
tions in the same way, and controls the Y3 input of the
)" I.C. The changing Y2 and Y3 inputs cause the "430"
to play the four variations sequentially.

Q1, $\overline{Q1}$, Q2, and $\overline{Q2}$ outputs of the flip-flops also drive
through D23 and R65, R67, R69 and R71. These diodes
resistors turn Q15 through Q18 "ON", one for each varia-
n selected, and the transistors drive the variation in-
ator lights. For example, in variation "A" Q1 and Q2
both at OV. Q2 applies negative bias to Q18, turning
"ON". Q1 back biases D20. Q18, therefore, drives
"A" variation light, turning it "ON".

istors R62 and R63 are a voltage divider providing -10V
the flip-flop I.C. power supply.

is turned "ON" by the pulse which resets the "430" I.C.,
thereby resets the flip-flop stages to variation "A",
the "Auto Vari" switch is "ON" and the rhythm is reset.

TEMPO LAMP

If the rhythm is not running, the X3 (1 cycle/1/4 measure) pulse triggers Q1 and Q2 "ON" through C1 and R45. D5 prevents C1 from being charged by the falling edge which appears across R4 when X3 goes negative. Q1 and Q2 drive the tempo lamp "ON".

If the rhythm unit is running, Q6 is "ON" and applies -14V to D2, preventing the X3 pulses from passing through D4 to C1. At the same time Q3 turns "OFF", applying OV to D1, allowing the X5 pulses (1 cycle/measure) to pass through D3 to C1. The tempo lamp now flashes once per measure rather than once per beat.

ORGAN CONTROL CIRCUITRY

Q7 is used for control of external circuitry in the organ.

If the "Silent/Sound" switch is in the "Sound" position and the "Autochord" button is depressed, J1-7 is at OV and Q7 is "OFF", putting -28V on J1-4. Otherwise J1-7 is at -14V and J1-4 is at OV due to Q7 being "ON".

ACCOMPANIMENT TRIGGER

Positive going pulses from pin 39 of the "430" I.C. are fed from J2-12 to the Autochord circuits of some organs, if the "Silent/Sound" switch is in the "Sound"position and the autochord button is depressed. Otherwise D12 holds J2-11 at -14V.

The pulses from the "430" I.C. also trigger Q8 "ON". C7, R36, R37 and R38 provide a decaying voltage through D12 to control autochord circuits in some organs.

PEDAL TRIGGERS

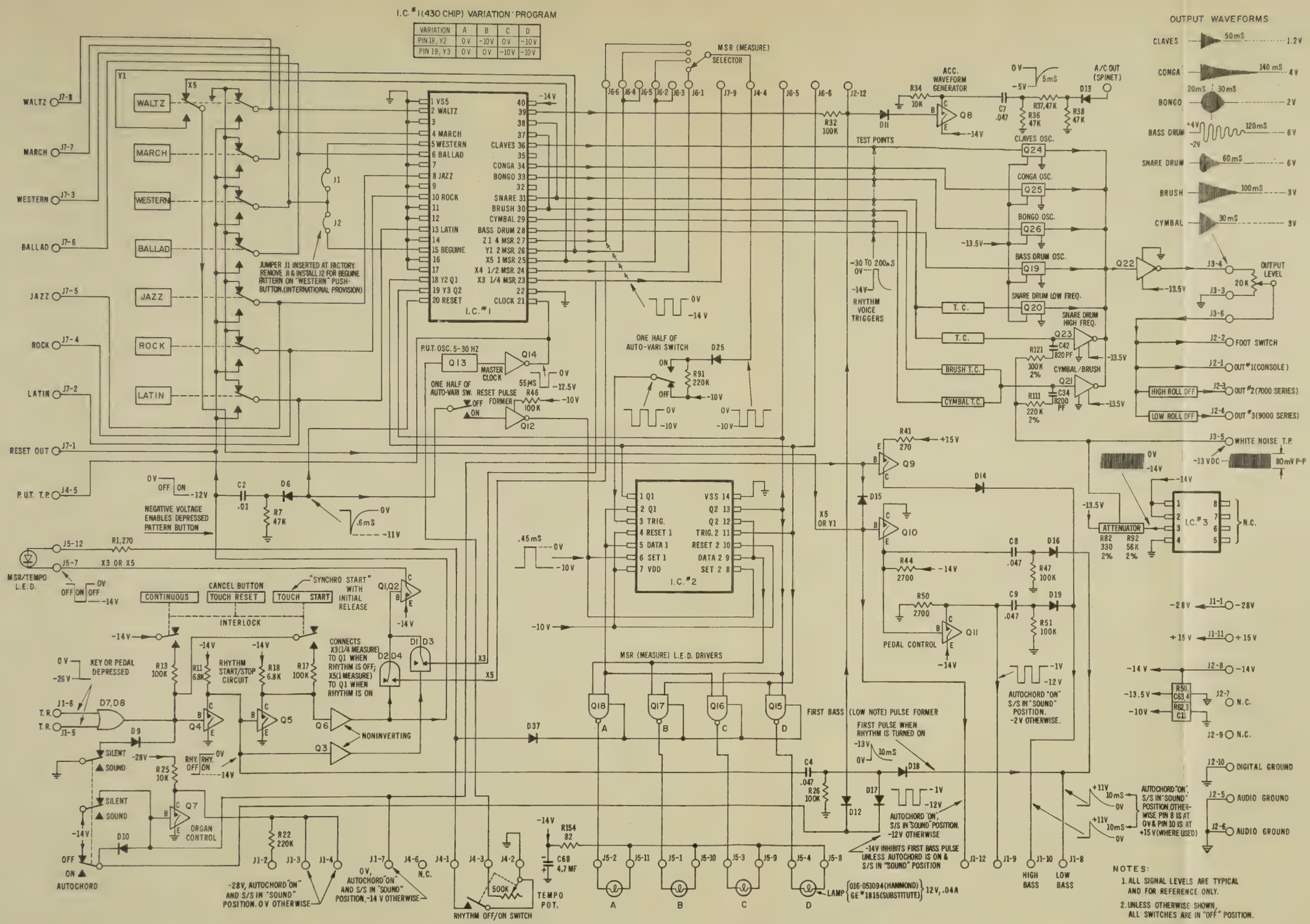
On the first beat of every measure, when X5 goes positive, Q10 is turned "ON" applying OV to J1-12, which triggers low bass. At the same time Q11 is turned "ON".

When the "Waltz" button is depressed, the low bass is triggered every other measure, since X5 is replaced by Y1 through the "Waltz" switch.

When X5 (Y1 on "Waltz") goes negative, Q10 is turned "OFF" and Q11 is turned "OFF". This puts OV on J1-9, and decaying waveform at J1-10, controlling high bass.

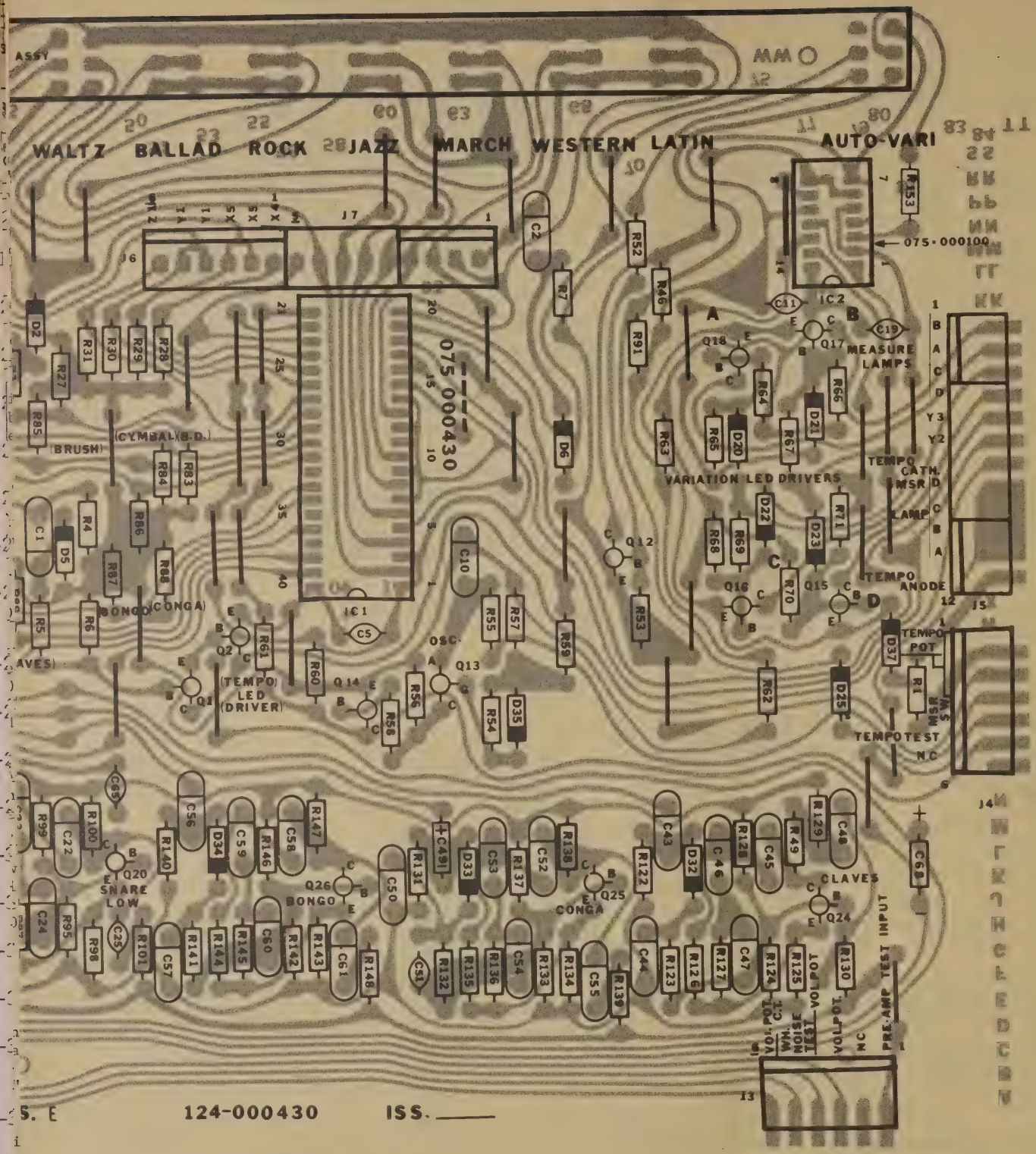
When the rhythm is first turned "ON", C4, R26, and D18 trigger the low bass once, since there is no transition of Q10 (caused by the "430" chip) to provide a pulse through C8 and D16.

If the "Autochord" button is not depressed or the "Silent/Sound" switch is in the "Silent" position, D15 cancels low bass pulses and D17 cancels the first low bass pulse. In addition Q9 turns on, putting +15V on J1-10 which holds some spinets in high bass mode.

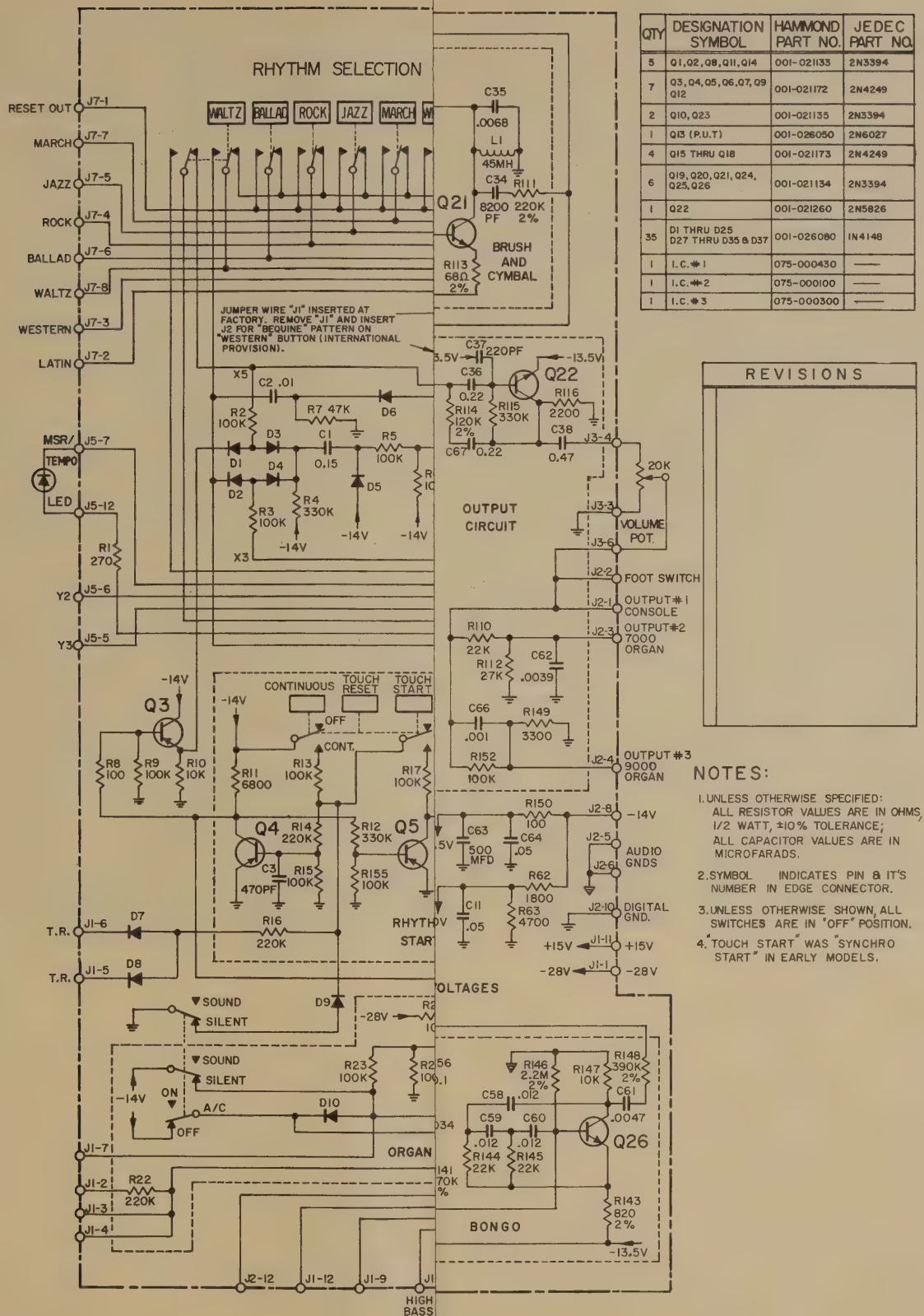


094-051413-B, AUTO-VARI 28 LOGIC SCHEMATIC DIAGRAM

FIGURE 3-51
AUTO VARI - 28 RHYTHM
UNIT LOGIC DIAGRAM



S. E 124-000430 ISS. ____



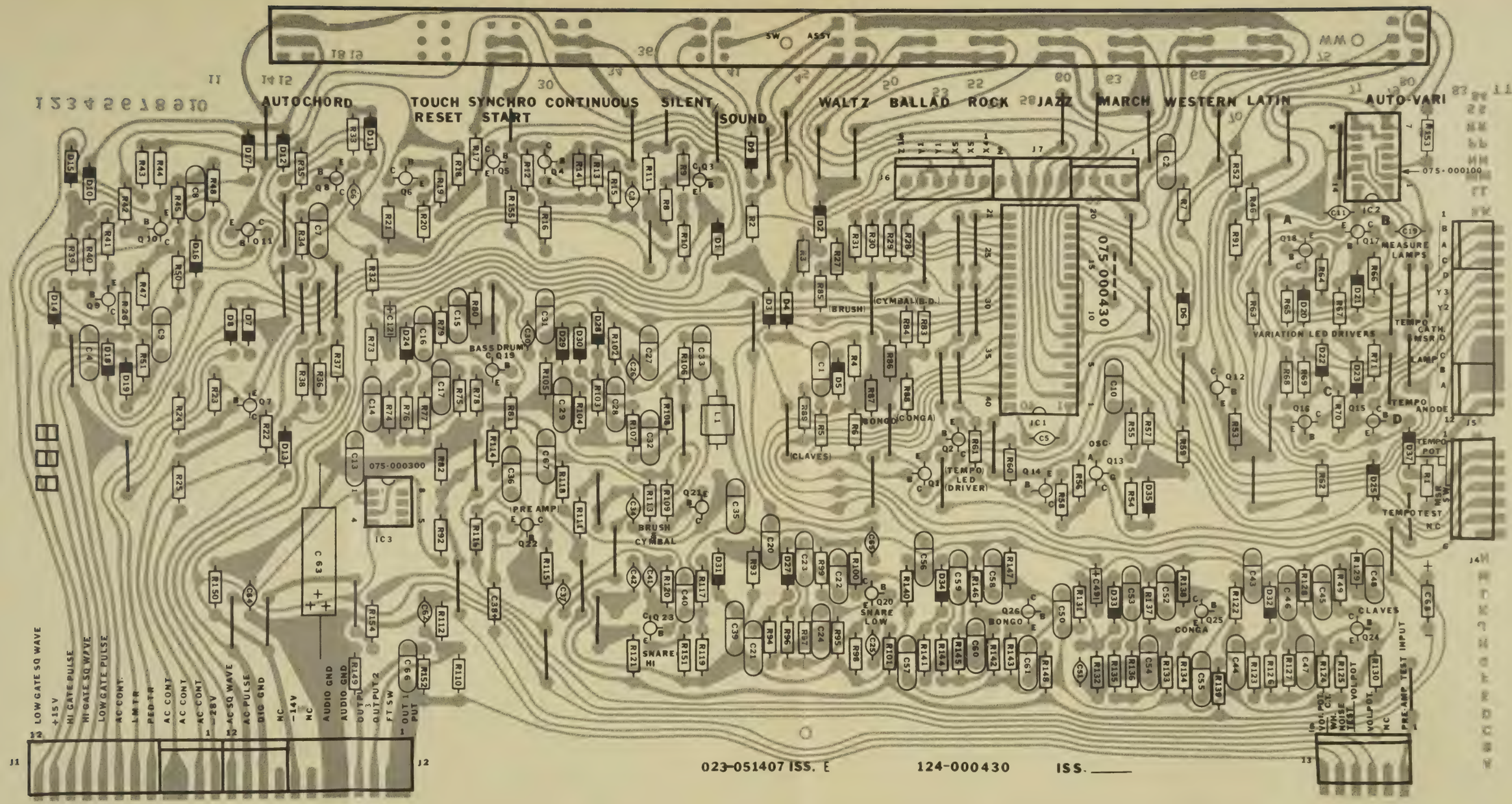
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
5	Q1,Q2,Q8,Q11,Q14	001-021133	2N3394
7	Q3,Q4,Q5,Q6,Q7,Q9 Q12	001-021172	2N4249
2	Q10,Q23	001-021135	2N3394
1	Q13 (P.U.T)	001-026050	2N6027
4	Q15 THRU Q18	001-021173	2N4249
6	Q19,Q20,Q21,Q24, Q25,Q26	001-021134	2N3394
1	Q22	001-021260	2N5826
35	D1 THRU D25 D27 THRU D35 & D37	001-026080	IN4148
1	I.C.#1	075-000430	——
1	I.C.#2	075-000100	——
1	I.C.#3	075-000300	——

REVISIONS

NOTES:

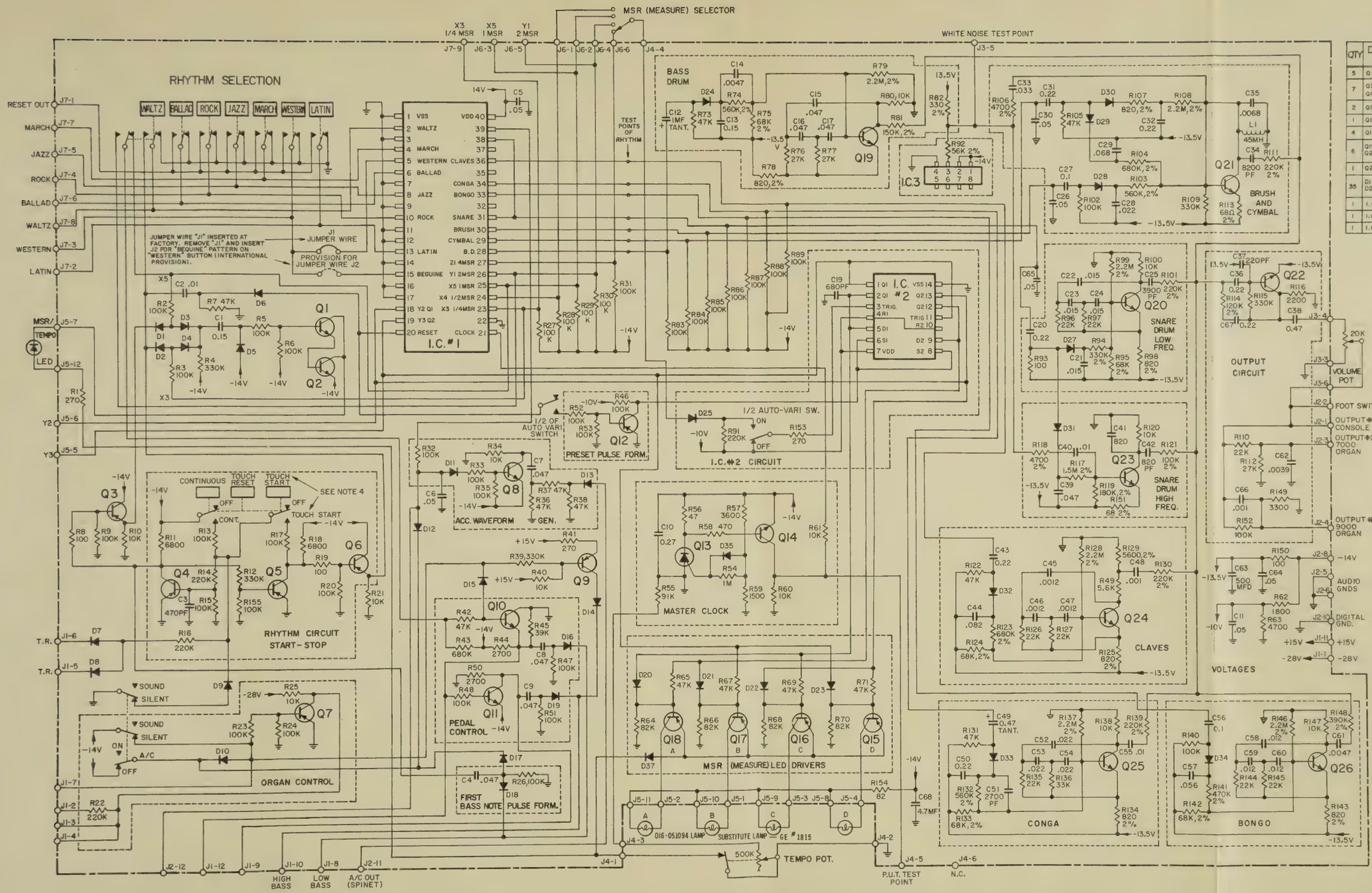
1. UNLESS OTHERWISE SPECIFIED: ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10% TOLERANCE; ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL ⊙ INDICATES PIN & IT'S NUMBER IN EDGE CONNECTOR.
3. UNLESS OTHERWISE SHOWN, ALL SWITCHES ARE IN "OFF" POSITION.
4. "TOUCH START" WAS "SYNCHRO START" IN EARLY MODELS.

FIGURE 3-53
AUTO VARI - 28 RHYTHM
BOARD - SCHEMATIC
(124-000430)



023-051407 ISS. E 124-000430 ISS. ____

FIGURE 3-52
AUTO VARI - 28 RHYTHM BOARD
LAYOUT
(124-000430)



QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
5	Q1,Q2,Q8,Q11,Q14	001-021133	2N3394
7	Q3,Q4,Q5,Q6,Q7,Q9 Q12	001-021172	2N4249
2	Q10,Q23	001-021135	2N3394
1	Q13 (P.U.T)	001-026050	2N6027
4	Q15 THRU Q18	001-021173	2N4249
6	Q19,Q20,Q21,Q24, Q25,Q26	001-021134	2N3394
1	Q22	001-021260	2N5826
35	D1 THRU D25 D27 THRU D35 & D37	001-026080	IN4148
1	I.C.#1	075-000430	——
1	I.C.#2	075-000100	——
1	I.C.#3	075-000300	——

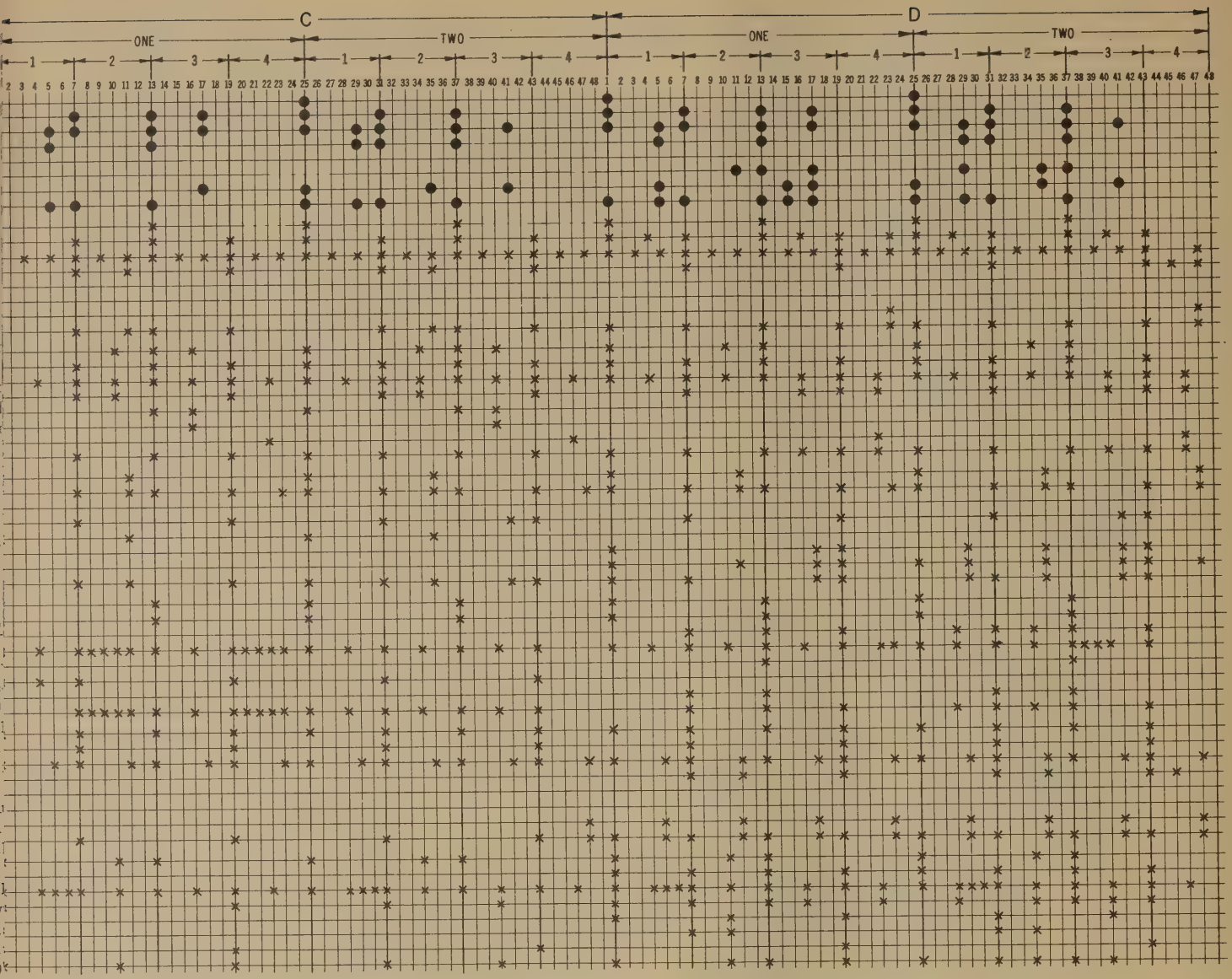
REVISIONS

NOTES:

1. UNLESS OTHERWISE SPECIFIED: ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10% TOLERANCE; ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL ⊖ INDICATES PIN 8 IT'S NUMBER IN EDGE CONNECTOR.
3. UNLESS OTHERWISE SHOWN, ALL SWITCHES ARE IN "OFF" POSITION.
4. "TOUCH START" WAS "SYNCHRO START" IN EARLY MODELS.

094-051343-B, SCHEMATIC DIAGRAM OF AUTO-VARI 28, P.W.B. 124-000430

FIGURE 3-53
AUTO VARI - 28 RHYTHM
BOARD - SCHEMATIC
(124-000430)



AND VARIATION CHART

SWITCH / TERM	REPEAT	PERCUSSION FAST	2	3	
	(S1)		(S2)	(S3)	
1	J-126-1		J-125-12 S3-1	S2-1	
2			P35-2	P35-1	
3	J-147-6 S4-1	NC	NC	NC	
4	J-124-13		NC	NC	
5	S4-5				
6	J-124-14	NC			

WIRE COLOR

SECOND VOICE	PIZZICATO 1 (OBOE)	PIZZICATO 2 (SAX)
(S4)	(S5)	(S6)
BROWN	BLUE (2)	YEL. (2)
RED	WHT/VIO(2)	CLEAR
ORANGE	NC	NC
YELLOW	YELLOW (2)	BLUE (2)
BLACK (2)	CLEAR	WHT/VIO(2)
VIOLET	NC	NC

SWITCH / TERM	BANJO (POST HORN)	HARPSICHORD (VIOLIN)	PIANO (DIAPASON)	PIANO SOLO	SUSTA UPPER SHORT
	(S7)	(S8)	(S9)	(S10)	(S11)
1	S6-1 S8-1	S7-1	J-106-7	NC	S12-1
2	J-106-12	J-106-8	J-126-14	S12-5	J-147- S12-2
3	NC	NC	NC	S9-5	NC
4	NC	NC	NC	J-125-15	NC
5	S6-4 S8-6				P32-2 S12-6
6	S6-5	S7-5	S8-5		P32-3

TAIN PER ORT	SUSTAIN UPPER LONG		PEDAL SUSTAIN 1	PEDAL SUSTAIN 2	LOWER TO PEDAL
1)	(S12)		(S13)	(S14)	S-15)
Y	GRAY (2)		NC	NC	NC
(2)	RED		NC	NC	NC
NC	NC		NC	NC	NC
NC	NC		NC	NC	NC
NGE	GREEN (2)		BLUE	GREEN	BLACK (2)
LET	ORANGE		ORANGE	BLUE (2)	VIOLET

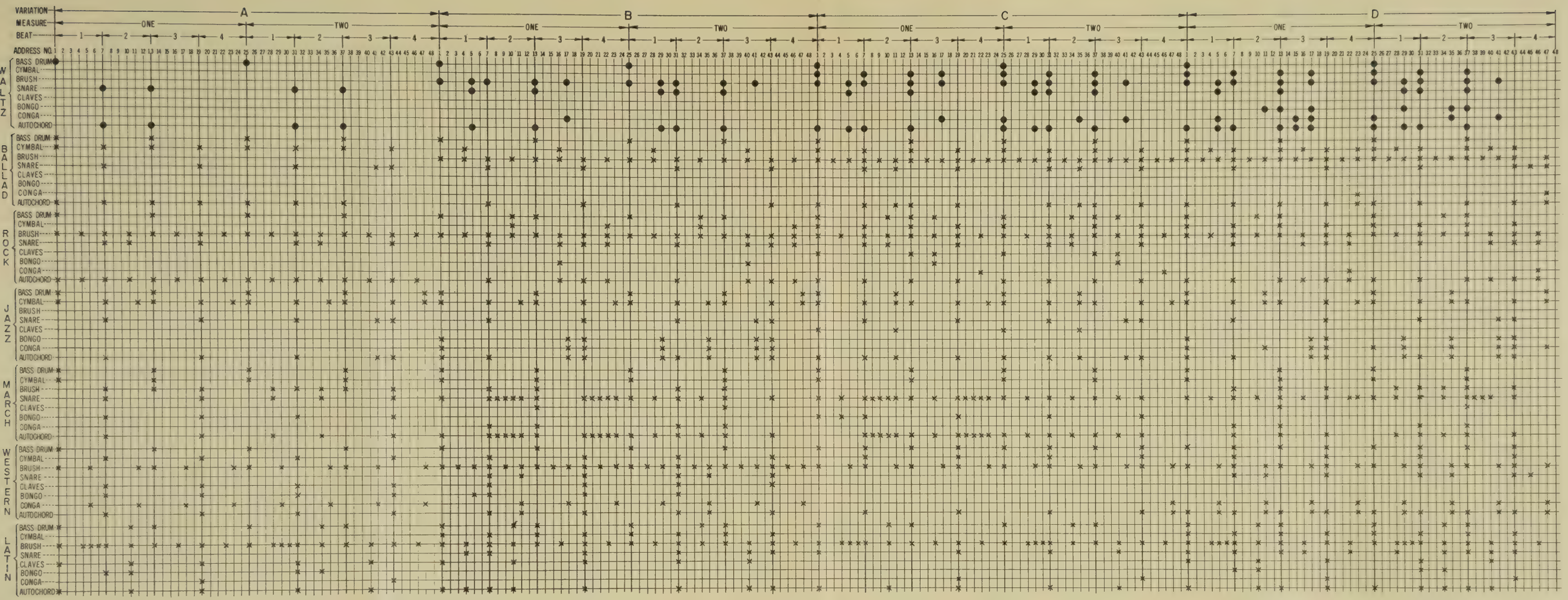
SWITCH / TERM	ACCOUSTIC TREMOLO ON LOWER	ACCOUSTIC TREMOLO CELESTE	ACCOUSTIC TREMOLO CHORUS	VIBRATO 1	VIBRA 2
	(S16)	(S17)	(S18)	(S19)	(S20)
1	NC	NC	NC	NC	NC
2	NC		NC	NC	S20-5
3	NC		NC	NC	P22-3
4	P114-15		P114-7	NC	P22-4
5	P42-15	P-42-8	P114-8	S20-6	P42-12 S20-2
6	P114-9	P-114-14	NC	J-126-6	S19-5

BRATO 2	DELAY VIBRATO	REVERB 1	REVERB 2		BRILLANCE	VOLUME SOFT
0)	(S21)	(S22)	(S23)		S24)	(S25)
NC	NC	ORANGE	NC		NC	Wht/Orange
OLET	NC	WHT/YEL	NC			BLK (2)
/BLUE	NC	NC	NC			NC
LOW	GREEN	NC	ORANGE(2)		NC	WHT/RED
(2)	YELLOW	BLACK	GREEN		CLEAR	BLK (2)
EN	NC	VIOLET	VIOLET		BLK (2)	NC

The PLUG
following
connector
first to
represent
the follo

J - Board
J/T - Jun
jus
J/T #1 -
J/T #2 -
J/T #3 -
J/T #4 -
J/T #5 -
J/T #6 -
L - Lower

FIGURE 3-55
CONTROL PANEL TAB SWITCH WIRING CHARTS AND CHART OF ABBREVIATION CODE (16,000 SERIES)



AUTO VARI-28 RHYTHM TRACKS AND VARIATION CHART

FIGURE 3-54
AUTO VARI - 28 RHYTHM
TRACKS AND VARIATIONS CHART

CONTROL PANEL TAB SWITCH ASSEMBLY WIRING CHART

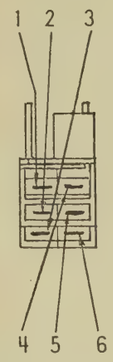
POINT TO POINT

SWITCH TERM	REPEAT	PERCUSSION FAST	2	3					SECOND VOICE	PIZZICATO 1 (OBOE)	PIZZICATO 2 (SAX)
	(S1)		(S2)	(S3)					(S4)	(S5)	(S6)
1	J-126-1		J-125-12 S3-1	S2-1					S1-3	P32-5 S6-4	S-5-4 S7-1
2			P35-2	P35-1					J125-8	P32-4 S6-5	J106-13
3	J-147-6 S4-1	NC	NC	NC					S1-2	NC	NC
4	J-124-13		NC	NC					J-147-11	J-126-12 S6-1	S5-1 S7-5
5	S4-5								S15-5 S1-5	P32-4 J106-14	S5-2 S7-6
6	J-124-14	NC							J125-9	NC	NC

SWITCH TERM	BANJO (POST HORN)	HARPSICHORD (VIOLIN)	PIANO (DIAPASON)	PIANO SOLO	SUSTAIN UPPER SHORT	SUSTAIN UPPER LONG		PEDAL SUSTAIN 1	PEDAL SUSTAIN 2	LOWER TO PEDAL	
	(S7)	(S8)	(S9)	(S10)	(S11)	(S12)		(S 13)	(S14)	(S15)	
1	S6-1 S8-1	S7-1	J-106-7	NC	S12-1	P42-6 S11-1		NC	NC	NC	
2	J-106-12	J-106-8	J-126-14	S12-5	J-147-21 S12-2	S11-2		NC	NC	NC	
3	NC	NC	NC	S9-5	NC	NC		NC	NC	NC	
4	NC	NC	NC	J-125-15	NC	NC		NC	NC	NC	
5	S6-4 S8-6				P32-2 S12-6	P42-9 S10-2		S14-6	P42-2	P42-3 S4-5	
6	S6-5	S7-5	S8-5		P32-3	S11-5		P34-4	P42-1 S13-5	P42-4	

SWITCH TERM	ACCOUSTIC TREMOLO ON LOWER	ACCOUSTIC TREMOLO CELESTE	ACCOUSTIC TREMOLO CHORUS	VIBRATO 1	VIBRATO 2	DELAY VIBRATO	REVERB 1	REVERB 2		BRILLANCE	VOLUME SOFT
	(S16)	(S17)	(S18)	(S19)	(S20)	(S21)	(S22)	(S23)		(S24)	(S25)
1	NC	NC	NC	NC	NC	NC	S23-4	NC		NC	P114-1
2	NC		NC	NC	S20-5	NC	P114-5	NC			S25-5
3	NC		NC	NC	P22-3	NC	NC	NC			NC
4	P114-15		P114-7	NC	P22-4	J-147-19	NC	P114-4 S22-1		NC	P114-2
5	P42-15	P-42-8	P114-8	S20-6	P42-12 S20-2	P22-2	S25-5	P114-3		P42-13	P42-14 S25-2
6	P114-9	P-114-14	NC	J-126-6	S19-5	NC	S23-6	S22-6		S25-5	NC

SWITCH VIEWED FROM FRONT OF ORGAN WITH CONTROL PANEL IN THE SWING UP POSITION



WITH TAB SWITCH IN THE UP(OFF) POSITION: IF SWITCH TERMINAL 5 & 6 OR 2 & 3 ARE USED, THE RESULT WILL BE A NORMALLY OPEN SWITCH.

IF SWITCH TERMINAL 5 & 4 OR 2 & 1 ARE USED, THE RESULT WILL BE A NORMALLY CLOSED SWITCH.

WIRE COLOR

SWITCH TERM	REPEAT		2	3					SECOND VOICE	PIZZICATO 1 (OBOE)	PIZZICATO 2 (SAX)
	(S1)		(S2)	(S3)					(S4)	(S5)	(S6)
1	RED		BROWN (2)	BROWN					BROWN	BLUE (2)	YEL. (2)
2	ORANGE		Wht/Red	Red					RED	WHT/VIO(2)	CLEAR
3	BROWN (2)		NC	NC					ORANGE	NC	NC
4			NC	NC					YELLOW	YELLOW (2)	BLUE (2)
5									BLACK (2)	CLEAR	WHT/VIO(2)
6									VIOLET	NC	NC

SWITCH TERM	BANJO (POST HORN)	HARPSICHORD (VIOLIN)	PIANO (DIAPASON)	PIANO SOLO	SUSTAIN UPPER SHORT	SUSTAIN UPPER LONG		PEDAL SUSTAIN 1	PEDAL SUSTAIN 2	LOWER TO PEDAL	
	(S7)	(S8)	(S9)	(s10)	(S11)	(S12)		(S13)	(S14)	S-15)	
1	Yel (2)	YELLOW	CLEAR #1	NC	GREY	GRAY (2)		NC	NC	NC	
2	RED	CLEAR	CLEAR	GREEN	RED (2)	RED		NC	NC	NC	
3	NC	NC	NC	ORANGE	NC	NC		NC	NC	NC	
4	NC	NC	NC	YELLOW	NC	NC		NC	NC	NC	
5	BLUE(2)	VIOLET	ORANGE	WHITE	ORANGE	GREEN (2)		BLUE	GREEN	BLACK (2)	
6	WHR/VIO	BLUE	VIOLET	VIOLET	VIOLET	ORANGE		ORANGE	BLUE (2)	VIOLET	

SWITCH TERM	ACCOUSTIC TREMOLO ON LOWER	ACCOUSTIC TREMOLO CELESTE	ACCOUSTIC TREMOLO CHORUS	VIBRATO 1	VIBRATO 2	DELAY VIBRATO	REVERB 1	REVERB 2		BRILLANCE	VOLUME SOFT
	(16)	(S17)	(S18)	(S19)	(S20)	(S21)	(S22)	(S23)		S24)	(S25)
1	NC	NC	NC	NC	NC	NC	ORANGE	NC		NC	Wht/Orange
2	NC		NC	NC	VIOLET	NC	WHT/YEL	NC			BLK (2)
3	NC		NC	NC	WHT/BLUE	NC	NC	NC			NC
4	CLEAR		YELLOW	NC	YELLOW	GREEN	NC	ORANGE(2)		NC	WHT/RED
5	GREEN	BLACK	CLEAR	GREEN	VIO (2)	YELLOW	BLACK	GREEN		CLEAR	BLK (2)
6	RED	VIOLET	NC	WHT/VIO	GREEN	NC	VIOLET	VIOLET		BLK (2)	NC

CHART ABBREVIATION CODE

The PLUG AND PIN NUMBERS WIRING CHART seen on the following pages have been arranged in plug and connector sequence from the lowest plug number first to the highest number last. These charts represent a point to point wiring reference, and the following abreviation code is used.

J - Board Connector
J/T - Junction Terminals (Located rear of organ, just below manual shelf).
J/T #1 - (-28 volts), Violet Wires
J/T #2 - Ground #2, Black Wires
J/T #3 - (-14 volts) Gray Wires
J/T #4 - Ground #1, White/Black Wires
J/T #5 - (+25 volts), Red Wires
J/T #6 - (-8 volts), White Wires
L - Lower
L/M - Lower Manual
L.H.- Left Hand
N.C. - No Connection
P - Plug
Pos. - Position
S - Tab Switches
S1 - Arpeggiator Switch
S2 - Arpeggiator Switch
SH - Shield
T/B - Tone Bar
T/S - Terminal Strip
U - Upper
U/M - Upper Manual
UL - Upper Board - Lower Connector (124-000223-002)
Uu - Upper Board - Upper Connector (124-000223-002)

FIGURE 3-55
CONTROL PANEL TAB SWITCH WIRING CHARTS AND CHART OF ABBREVIATION CODE (16,000 SERIES)

S WIRING CHART OF 16100 SERIES ORGAN

10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
J-114U-11	J-114U-1	J-114U-6	J-115U-18	J-114-19	J-116U-5	J-115U-3	N. C.	J-116U-15	J-116U-20	J-116U-10	J-115U-8	J-115U-13	J-114U-9	J-115U-21
J-115U-7	J-115U-12	J-114U-10	J-115U-22	J-114U-5	J-115U-17	J-114U-18	N.C.	J-116U-6	J-115U-4	J-116U-16	J-116U-21	J-116U-11	J-115U-9	J-115U-14
N.C.	N.C.	J-116U-17	J-116U-7	N.C.	J-115U-5	J-115U-10	J-114U-12	J-114U-2	J-114U-7	J-115U-19	J-114U-17			
J-114L-11	J-114L-1	J-114L-6	J-115L-18	J-114L-19	J-116L-5	J-115L-3	N.C.	J-116L-15	J-116L-20	J-116L-10	J-116L-8	J-115L-13	J-114L-9	J-115L-21
J-115L-7	J-115L-12	J-114L-10	J-115L-22	J-114L-5	J-115L-17	J-114L-18	N.C.	J-116L-6	J-115L-4	J-116L-16	J-116L-21	J-116L-11	J-115L-9	J-115L-14
N.C.	N.C.	J-116L-17	J-116L-7	N.C.	J-115L-5	J-115L-10	J-114L-12	J-114L-2	J-114L-7	J-115L-19	J-114L-17			
-10-1 T. Strip -14 Speaker	P2-2	P-80-6												
J/T-1 (-28 V)	N.C.	J/T #6 (-8 V)		Ext. (S Pedal)	J/T #3 (-14V)									
N.C.	N.C.	J-141-11												
J/T #2 (Gnd. #2)	N.C.	J-141-2												
J-112L-10	J-112L-8	J-112L-12	J-112L-1	N.C.	N.C.									
J-111L-10	J-111L-8	J-111L-12	N.C.	J/T #2 (GND.#2)	P-101									

NOTE:
REFER TO PLUG AND
CONNECTOR LOCATIONS
PAGE 2-26 AND 2-27

	PLUG NO.	PIN 1	2	3	4	22	23	24
CONNECTORS	P-31	J-108U-3	J-113U-2	J-113U-3	J-113			
	P-32	J-126-10	S-11-5	S-11-6	S-5-			
CONNECTORS	P-33	J-142-4	N.C.	N.C.	J-14 P-57			
	P-34	J-147-12	N.C.	J-106-18	S13 P57			
CONNECTORS	P-35	S3-2	S2-2	J-126-5 J-147-14				
	P-36	J-128-3	J-128-4	J-128-2 J-117-3				
CONNECTORS								
CONNECTORS	P-42	S14-6	S-14-5	S-15-5	S15-			
	P-43	P-54-2	P-66-3	J-145-14 P-43-8	P-54 J-14			
CONNECTORS								
CONNECTORS								
CONNECTORS	P-53	J-113L-4	J-113L-5	N.C.				
	P-54	P-43-4	P-43-1	N.C.				
CONNECTORS	P-57	P-34-4						
	P-58	J-113L-2						
CONNECTORS								
CONNECTORS	P-66	J-104-4	J-104-7	P-43-2				
	P-67	J-108L-3	J-108L-2	J-108L-19				
CONNECTORS								
CONNECTORS	P-73	J-109U-14						
	P -74	J/T #1 (-28V)						
CONNECTORS								
CONNECTORS	P-79	J-145-21	P-79-5 J-145-1	J-145-20 P-79-5	J-145			
	P-80	J-254-9	J-255-9	J-255-8	J-254			

FIGURE 3-57
PLUG AND PIN NUMBERS
WIRING CHART
(P-31 THRU P-80)

PLUG AND PIN NUMBERS WIRING CHART OF 16100 SERIES ORGAN

	PLUG NO.	PIN # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
UPPER MANUAL BOARD #1 KEYS 1 THRU 22	#1	J-114U-21	J-116U-3	J-115U-1	J-116U-13	J-116U-18	J-116U-8	J-115U-6	U/M #2-8 P-83	J-115U-11	J-114U-11	J-114U-1	J-114U-6	J-115U-18	J-114-19	J-116U-5	J-115U-3	N. C.	J-116U-15	J-116U-20	J-116U-10	J-115U-8	J-115U-13	J-114U-9	J-115U-21
UPPER MANUAL BOARD #2 KEYS 23 THRU 44	#2	J-114U-4	J-115U-16	J-114U-20	J-116U-4	J-115U-2	J-116U-14	J-116U-19	U/M #1-8 U/M #3-8	J-116U-9	J-115U-7	J-115U-12	J-114U-10	J-115U-22	J-114U-5	J-115U-17	J-114U-18	N.C.	J-116U-6	J-115U-4	J-116U-16	J-116U-21	J-116U-11	J-115U-9	J-115U-14
UPPER MANUAL BOARD #3 KEYS 45 THRU 61	#3	J-114U-8	J-115U-20	J-114U-3	J-115U-15	J-114U-13	J-116U-2	J-116U-22	U/M #2-8	J-116U-12	N.C.	N.C.	J-116U-17	J-116U-7	N.C.	J-115U-5	J-115U-10	J-114U-12	J-114U-2	J-114U-7	J-115U-19	J-114U-17			
LOWER MANUAL BOARD #1 KEYS 1 THRU 22	#1	J-114L-21	J-116L-3	J-115L-1	J-116L-13	J-116L-18	J-116L-8	J-115L-6	L/M #2-8	J-115L-11	J-114L-11	J-114L-1	J-114L-6	J-115L-18	J-114L-19	J-116L-5	J-115L-3	N.C.	J-116L-15	J-116L-20	J-116L-10	J-116L-8	J-115L-13	J-114L-9	J-115L-21
LOWER MANUAL BOARD #2 KEYS 23 THRU 44	#2	J-114L-4	J-115L-16	J-114L-20	J-116L-4	J-115L-2	J-116L-14	J-116L-19	L/M #1-8 L/M #3-8	J-116L-9	J-115L-7	J-115L-12	J-114L-10	J-115L-22	J-114L-5	J-115L-17	J-114L-18	N.C.	J-116L-6	J-115L-4	J-116L-16	J-116L-21	J-116L-11	J-115L-9	J-115L-14
LOWER MANUAL BOARD #3 KEYS 45 THRU 61	#3	J-114L-8	J-115L-20	J-114L-3	J-115L-15	J-114L-13	J-116L-2	J-116L-22	L/M #2-8 J-147-15 VIA P-87/88	J-116L-12	N.C.	N.C.	J-116L-17	J-116L-7	N.C.	J-115L-5	J-115L-10	J-114L-12	J-114L-2	J-114L-7	J-115L-19	J-114L-17			
TONE CABINET OUTLET	P-1	GND.	P3-9		P3-10		Fast Mtr. Sw.	Slow Mtr. Sw.	120 VAC	120 VAC															
TO TREMOLO ASSEMBLY	P-2	P3-6	P3-11	P3-9	P3-1	P3-5	255-6																		
POWER AMP. ASSY. (126-000117)	P-3	P2-4	(P-Sw. 2)	(P-Sw-3)	(P-Sw-1)	P-2-5	P-2-1	N.C.	N.C.	Ext. T. Strip -13 P2-3	-10-1 T. Strip -14 Speaker	P2-2	P-80-6												
POWER AMP. ASSY. (126-000117)	P-4	J/T #1 (#1 Gnd.)	P-80-5	P-80-8	J-254 J-255	J-254 J-255	N. C.	J/T #5 (+25 V)	N.C.	J/T #2 (#2 Gnd)	J/T-1 (-28 V)	N.C.	J/T #6 (-8 V)		Ext. (S Pedal)	J/T #3 (-14V)								
POWER SWITCH	A.C. SWITCH	P-3-4	P-3-2	P-3-3																					
AUTO VARI -28	J-1	J-141-6	N.C.	N.C.	N.C.	J-104-19	J-142-6	J-141-7	N.C.	J-141-12	N.C.	N.C.	J-141-11												
AUTO VARI -28	J-2	J-144-9	N.C.	N.C.	N.C.	J/T #4 (Gnd. #1)	N.C.	N.C.	J-141-5	N.C.	J/T #2 (Gnd. #2)	N.C.	J-141-2												
SWELL PEDAL	P-12	J-143-8	J-143-6	J-144-7	N.C.	J/T #4 (Gnd. #1)	N.C.																		
PEDAL SWITCH ASSY. PEDALS 13 THRU 25	P-13	J-112L-13	J-112L-5	J-112L-3	J-112L-4	J-112L-2	J-112L-6	J-112L-7	J-112L-11	J-112L-9	J-112L-10	J-112L-8	J-112L-12	J-112L-1	N.C.	N.C.									
PEDAL SWITCH ASSY. PEDALS 1 THRU 12	P-14	J-111L-13	J-111L-5	J-111L-3	J-111L-4	J-111L-2	J-111L-6	J-111L-7	J-111L-11	J-111L-9	J-111L-10	J-111L-8	J-111L-12	N.C.	J/T #2 (GND.#2)	P-101									
CONNECTORS	P-21 / P-22	J-146-2 / J-126-6	J-146-3 / S-21-5	J-146-4 / S-20-3	J-146-5 / S-20-4	J-117U-4 THRU 5 / J-126-4	N.C. / N.C.																		
CONNECTORS	P-26 / P-27	J-127-3 / J-125-7																							

NOTE:
REFER TO PLUG AND CONNECTOR LOCATIONS PAGE 2-26 AND 2-27

FIGURE 3-56
PLUG AND PIN NUMBERS
WIRING CHART
(P-1 THRU P-27)

PLUG AND PIN NUMBERS WIRING CHART FOR 16100 SERIES ORGAN

	PLUG NO.	PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CONNECTORS	P-31	J-108U-3	J-113U-2	J-113U-3	J-113U-4	J-113U-5	N.C.																		
	P-32	J-126-10	S-11-5	S-11-6	S-5-2	S-5-1	N.C.																		
CONNECTORS	P-33	J-142-4	N.C.	N.C.	J-142-1 P-57	N.C.	J-144-10																		
	P-34	J-147-12	N.C.	J-106-18	S13-6 P57	N.C.	J-106-20																		
CONNECTORS	P-35	S3-2	S2-2	J-126-5 J-147-14																					
	P-36	J-128-3	J-128-4	J-128-2 J-117-3																					
CONNECTORS																									
CONNECTORS	P-42	S14-6	S-14-5	S-15-5	S15-6	N.C.	S12-1	S10-5	S17-5	S12-5	N.C.	N.C.	S20-5	S24-5	S25-5	S16-5									
	P-43	P-54-2	P-66-3	J-145-14 P-43-8	P-54-1 J-144-12	N.C.	J/T #3 (-14 V) J-144-4	J/T #6 (-8 V)	P-43-3 P-43-14	P-66-5	J-143-3	NC.	J-104-21 J/T #1 (-28 V)	J-143-4	P-43-4 J-144-12	J-143-2									
CONNECTORS																									
CONNECTORS																									
CONNECTORS	P-53	J-113L-4	J-113L-5	N.C.																					
	P-54	P-43-4	P-43-1	N.C.																					
CONNECTORS	P-57	P-34-4																							
	P-58	J-113L-2																							
CONNECTORS																									
CONNECTORS	P-66	J-104-4	J-104-7	P-43-2		P-43-9	J-143-5																		
	P-67	J-108L-3	J-108L-2	J-108L-19		J-108U-19	J-102-11																		
CONNECTORS																									
CONNECTORS	P-73	J-109U-14																							
	P-74	J/T #1 (-28V)																							
CONNECTORS																									
CONNECTORS	P-79	J-145-21	P-79-5 J-145-1	J-145-20 P-79-5	J-145-19	P-79-3 P-79-4	P-115-14	N.C.		N.C.															
	P-80	J-254-9	J-255-9	J-255-8	J-254-8	P-4-2	P-3-12	N.C.		N.C.															

NOTE:
REFER TO PLUG AND CONNECTOR LOCATIONS PAGE 2-26 AND 2-27

FIGURE 3-57
PLUG AND PIN NUMBERS
WIRING CHART
(P-31 THRU P-80)

S WIRING CHART OF 16100 SERIES ORGAN

10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
T.-2 ND. #2)	J-102U-9	N.C.												
T. 2 ND. #2)	P-67-6	J-103U-11												
T. 2 ND.#2)	J-102U-12	N.C.												
-143-10	N.C.	N.C.	TO PEDAL T/B	N.C.		POS. #8 PEDAL T/B ASSY.	J.T. 4 (GND. #1)	N.C.	J-1-5 J-142-3	P-102	P-143-12 J-141-6	J-144-3 J-142-2		
N.C.	N.C.	S-7-2	S-6-2	S-5-5	N.C.	N.C.	J-125-1 J/T 2 (Gnd. #2)	P-34-3	N.C.	P-34-6	J-126-8	N.C.		
129-4	J-129-3	J-129-2	J-101U-6	J-101U-8	J-103U-8	J-103U-7	J-103U-5	J-103-6	P-67-5	J-129-12	J/T -2 (#2 GND)	J-129-11		

NOTE:
REFER TO PLUG AND
CONNECTOR LOCATIONS
PAGE2-26 AND 2-27

	PLUG NO.	PIN 1	2	3	4	21	22	23	24
U/M SYNTH. BOARD 124-000223 (4)	J-108L	J-129-1 J/T 3 (-14 V)	P-67-2	P-67-1	J-131-10	31-12	J-131-11		
U/M SYNTH. BOARD 124-000223-002 (2)	J-109U	J-109L-1	J-109L-2	J-109L-3	J-109L-4				
U/M SYNTH. BOARD 124-000223 (4)	J-109L	J-109U-1	J-109U-2	J-109U-3	J-109U-4				
U/M SYNTH. BOARD 124-000223-002 (2)	J-110Uu	J-146-22	J-146-21	J-146-20	J-146-19				
U/M SYNTH. BOARD 124-000223-002 (2)	J-110U1	J-110L-1	J-110L-2	J-110L-3	J-110L-4	.C.	N.C.		
U/M SYNTH. BOARD 124-000223 (4)	J-110L	J-110U-1	J-110U-2	J-110U-3	J-110U-4				
L/M SYNTH. BOARD 124-000223 (4)	J-111L	N.C.	P-14-5	P-14-3	P-14-4				
			NOTE: P-13 & P-14 LOCATED AT P8						
L/M SYNTH. BOARD 124-000223 (4)	J-112L	P-13-13	P-13-5	P-13-3	P-13-4				
U/M SYNTH. BOARD 124-000223-002 (2)	J-113U	J-101U-4	P-31-2	P-31-3	P-31-4	S			
L/M SYNTH. BOARD 124-000223 (4)	J-113L	J-101L-4	P-58	N.C.	P-53-1				
U/M SYNTH. BOARD 124-000223-002 (2)	J-114U	U/M #1-11	U/M #3-18	U/M #3-3	U/M #2-1	#1-1	N.C.		
L/M SYNTH. BOARD 124-000223 (4)	J-114L	L/M #1-11	L/M #3-18	L/M #3-3	L/M #2-1	#1-1	N.C.		
U/M SYNTH. BOARD 124-000223-002 (2)	J-115-U	U/M #1-3	U/M #2-5	U/M #1-16	U/M #2-19	#1-24	U/M #2-13		

FIGURE 3-59
PLUG AND PIN NUMBERS
WIRING CHART
(J-108L THRU J-115U)

PLUG AND PIN NUMBERS WIRING CHART OF 16100 SERIES ORGAN

	PLUG NO.	PIN # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CONNECTOR	P-83	U/M #1-8																							
	P-84	J-147-15																							
CONNECTOR	P-87	J-142-5																							
	P-88	L/M #3-8																							
CONNECTOR	P-101	P-14-15																							
	P-102	J-104-20																							
SINE WAVE FILTER #1 124-000201 (8-U)	J-101U	J-102U-1	N.C.	N.C.	J-113U-1 J-113-L/M 1	J-113U-10 J-113L-10	J-108U-13 J-108L-13	J-113U-12 J-113L-12	J-108U-14 J-108L-14	N.C.	J.T.-2 (GND. #2)	J-102U-9	N.C.												
SINE WAVE FILTER #2 124-000202 (9-U)	J-102U	J-101U-1 J-103U-1	N.C.	J-103U-4 J.T. -6 (-8 V)	J-113U-11 J-113L-11	J-113U-7 J-113L-7	J-113U-6 J-113L-6	J-113U-8 J-113L-8	J.T. 5 (+25 V)	J-101U-11	J.T. 2 (GND. #2)	P-67-6	J-103U-11												
SINE WAVE FILTER #3 124-000204 (10-U)	J-103U	J-102U-1	N.C.	N.C.	J-102U-3	J-108U-17 & L-17	J-108U-18 &L-18	J-108U-16 &L-16	J-108U-15 & L-15	J-113U-9 & L-9	J.T. 2 (GND.#2)	J-102U-12	N.C.												
PEDAL FILTER BOARD 124-000206 (13)	J-104	J-141-1	J-142-10	N.C.	P-66-1	N.C.	N.C.	P-66-4	N.C.	N.C.	J-143-10	N.C.	N.C.	TO PEDAL T/B	N.C.		POS. #8 PEDAL T/B ASSY.	J.T. 4 (GND. #1)	N.C.	J-1-5 J-142-3	P-102	P-143-12 J-141-6	J-144-3 J-142-2		
BRIGHT PERC. BOARD 124-000208 (14)	J-106	N.C.	J-126-15	P-108	J-125-10	N.C.	N.C.	S-9-1	S-18-2	N.C.	N.C.	N.C.	S-7-2	S-6-2	S-5-5	N.C.	N.C.	J-125-1 J/T 2 (Gnd. #2)	P-34-3	N.C.	P-34-6	J-126-8	N.C.		
CONNECTOR	P-108	J-106-3 S-10-6																							
	P-109	J-245U-6																							
U/M SYNTH. BOARD 124-000223-002 (2)	J-108U	J-131-1	N.C.	P-31-1	J-129-10	J-129-9	J-129-8	J-129-7	J-129-6	J-129-5	J-129-4	J-129-3	J-129-2	J-101U-6	J-101U-8	J-103U-8	J-103U-7	J-103U-5	J-103-6	P-67-5	J-129-12	J/T -2 (#2 GND)	J-129-11		

NOTE:
REFER TO PLUG AND CONNECTOR LOCATIONS PAGE2-26 AND 2-27

FIGURE 3-58
PLUG AND PIN NUMBERS
WIRING CHART
(P-83 THRU J-108U)

PLUG AND PIN NUMBERS WIRING CHART OF 16100 SERIES ORGAN

	PLUG NO.	PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
U/M SYNTH. BOARD 124-000223 (4)	J-108L	J-129-1 J/T 3 (-14 V)	P-67-2	P-67-1	J-131-10	J-131-9	J-131-8	J-131-7	J-131-6	J-131-5	J-131-4	J-131-3	J-131-2	J-101L-6	J-101L-8	J-103L-8	J-103L-7	J-103L-5	J-103L-6	P-67-3	J.T - 2 (GND #2)	J-131-12	J-131-11		
U/M SYNTH. BOARD 124-000223-002 (2)	J-109U	J-109L-1	J-109L-2	J-109L-3	J-109L-4	J-109L-5	J-109L-6	J-109L-7	J-109L-8	J-109L-9	J109L-10	J-109L-11	J-109L-12	N.C.	J/T #1 (-28 V) via P-73/74 (-28 V)	N.C.									
U/M SYNTH. BOARD 124-000223 (4)	J-109L	J-109U-1	J-109U-2	J-109U-3	J-109U-4	J-109U-5	J-109U-6	J-109U-7	J-109U-8	J109U-9	J-109U-10	J-109U-11	J-109U-12												
U/M SYNTH. BOARD 124-000223-002 (2)	J-110Uu	J-146-22	J-146-21	J-146-20	J-146-19	J-146-18	J-146-17	J-146-16	J-146-15	J-146-14	J-146-13	J-146-12	J-146-11	J-146-10	N.C.	N.C.									
U/M SYNTH. BOARD 124-000223-002 (2)	J-110U1	J-110L-1	J-110L-2	J-110L-3	J-110L-4	J-110L-5	J-110L-6	J-110L-7	J-110L-8	J-110L-9	J-110L-10	J-110L-11	J-110L-12	J-110L-13	N.C.	N.C.	N.C.	N.C.	N,C.	N.C.	N.C.	N.C.	N.C.		
U/M SYNTH. BOARD 124-000223 (4)	J-110L	J-110U-1	J-110U-2	J-110U-3	J-110U-4	J-110U-5	J-110U-6	J-110U-7	J-110U-8	J-110U-9	J-110U-10	J-110U-11	J-110U-12	J-110U-13	N.C.	N.C.									
L/M SYNTH. BOARD 124-000223 (4)	J-111L	N.C.	P-14-5	P-14-3	P-14-4	P-14-2	P-14-6	P-14-7	P-14-11	P-14-9	P-14-10	P-14-8	P-14-12	P-14-1	N.C.	N.C.									
L/M SYNTH. BOARD 124-000223 (4)	J-112L	P-13-13	P-13-5	P-13-3	P-13-4	P-13-2	P-13-6	P-13-7	P-13-11	P-13-9	P-13-10	P-13-8	P-13-12	P-13-1	N.C.	N.C.									
U/M SYNTH. BOARD 124-000223-002 (2)	J-113U	J-101U-4	P-31-2	P-31-3	P-31-4	P-31-5	J-102U-6	J-102U-5	J-102U-7	J-103U-9	J-101U-5	J-102U-4	J-101U-7												
L/M SYNTH. BOARD 124-000223 (4)	J-113L	J-101L-4	P-58	N.C.	P-53-1	P-53-2	J-102L-6	J-102L-5	J-102L-7	J-103L-9	J-101L-5	J-102L-4	J-101L-7												
U/M SYNTH. BOARD 124-000223-002 (2)	J-114U	U/M #1-11	U/M #3-18	U/M #3-3	U/M #2-1	U/M #2-14	U/M #1-12	U/M #3-19	U/M #3-1	U/M #1-23	U/M #2-12	U/M #1-10	U/M #3-17	U/M #3-5	N.C.	N.C.	N.C.	U/M #3-21	U/M #2-16	U/M #1-14	U/M #2-3	U/M #1-1	N.C.		
L/M SYNTH. BOARD 124-000223 (4)	J-114L	L/M #1-11	L/M #3-18	L/M #3-3	L/M #2-1	L/M #2-14	L/M #1-12	L/M #3-19	L/M #3-1	L/M #1-23	L/M #2-12	L/M #1-10	L/M #3-17	L/M #3-5	N.C.	N.C.	N.C.	L/M #3-21	L/M #2-16	L/M #1-14	L/M #2-3	L/M #1-1	N.C.		
U/M SYNTH. BOARD 124-000223-002 (2)	J-115-U	U/M #1-3	U/M #2-5	U/M #1-16	U/M #2-19	U/M #3-15	U/M #1-7	U/M #2-10	U/M #1-21	U/M #2-23	U/M #3-16	U/M #1-9	U/M #2-11	U/M #1-22	U/M #2-24	U/M #3-4	U/M #2-2	U/M #2-15	U/M #1-13	U/M #3-20	U/M #3-2	U/M #1-24	U/M #2-13		

NOTE: P-13 & P-14 LOCATED AT PEDAL SWITCH ASSEMBLY

NOTE:
REFER TO PLUG AND CONNECTOR LOCATIONS PAGE 2-26 AND 2-27

FIGURE 3-59
PLUG AND PIN NUMBERS
WIRING CHART
(J-108L THRU J-115U)

ERS WIRING CHART OF 16100 SERIES ORGAN

	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2-23	L/M #3-16	L/M #1-9	L/M #2-11	L/M #1-22	L/M #2-24	L/M #3-4	L/M #2-2	L/M #2-15	L/M #1-13	L/M #2-20	L/M #3-2	L/M #1-24	L/M #2-13		
2-9	U/M #1-20	U/M #2-22	U/M #3-9	U/M #1-4	U/M #2-6	U/M #1-18	U/M #2-20	U/M #3-12	U/M #1-5	U/M #2-7	U/M #1-19	U/M #2-21	U/M #3-7		
2-9	L/M #1-20	L/M #2-22	L/M #3-9	L/M #1-4	L/M #2-6	L/M #1-18	L/M #2-20	L/M #3-12	L/M #1-5	L/M #2-7	L/M #1-19	L/M #2-21	L/M #3-7		
	126-4	126-4	126-4	126-4	126-4	126-4	NOTE:	117U-4 THRU 15 via P-21/22-5							
	J-106-4	N.C.	S-2-1	S-1-4	S-1-6	S-10-4									
V)	J-108U-3 via P-33/34	J-125-1	S-5-4	N.C.	S-9-2	J-106-2									
U-3	J-245U-4	Pos. #1 U/M Tone/ Bar Return	U/M T/B 1'	U/M T/B 1-1/2'	U/M T/B 1-3/5'	U/M T/B 2'	U/M T/B 2-2/3'	U/M T/B 4'	U/M T/B 8'	U/M T/B 5-1/3'	U/M T/B 16'	N. C.	N.C.		
J-5	J-108U-4	J-108U-22	J-108U-20												
/B	L/M T/B 2'	L/M T/B 2-2/3'	L/M T/B 4'	L/M T/B 8'	L/M T/B 5-1/3'	L/M T/B 16'									
L-5	J-108L-4	J-108L-22	J-108L-21												
5	N.C.	N.C.	N.C.	N.C.	S-17-6	S-16-4									
-8	N.C.	J-145-3	J-144-5 J-143-15	N.C.	P-79-6	J-143-12									

NOTE:
REFER TO PLUG AND CONNECTOR LOCATIONS PAGE 2-26 AND 2-27

	PLUG NO.	PIN 1	19	20	21	22	23	24
STAIRCASE WAVE PERC. BOARD 124-000340 (3)	BOARD PLUGS INTO MOTHER BOARD 124-000223-002							
L/M SYNTHESIS DAUGHTER BOARD 124-000341 (5)	BOARD PLUGS INTO MOTHER BOARD 124-000223							
AUTO-ACCOMP BOARD 124-000424 (17)	J-141	J-104-2						
AUTO-ACCOMP. BOARD 124-000424 (17)	J-142	P-33-4						
MIXER #2 BOARD 124-000376 (15)	J-143	J-143-9						
MIXER #1 BOARD 126-000374 (15)	J-144	P-115-2						
MIXER #3 BOARD 124-000377 (16)	J-145	J-255-9	P-4-3 via P-79/80-8	J-255-8 via P-79/80-3	J-254-9 via P-79/80-1	J/T 5 (+25 V) J-144-3		
MDD GENERATOR BOARD 124-000265 (1)	J-146	N.C.	J-110U-4	J-110U-3	J-110U-2	J-110U-1	N.C.	N.C.
REPEAT OSC. AND DETECTOR BOARD 124-000353 (12)	J-147	J-126-7 J-147-7	S-21-4	J-125-2	S-11-2	N.C.		
REVERB AMP. BD. 124-000166	J-150	P-115-5						
UPPER MANUAL PISTON PRESETS	J-245U	J-127-4						
LOWER MANUAL PISTON PRESETS	J-245L	N.C.						
POWER AMP. 126-000117	J-254	P-4-5						
POWER AMP. 126-000117	J-255	P-4-5						

UG AND
OCATIONS
ND 2-27

FIGURE 3-61
PLUG AND PIN NUMBER
WIRING CHART
(J-141 THRU J-255)

PLUG AND PIN NUMBERS WIRING CHART OF 16100 SERIES ORGAN

	PLUG NO.	PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
L/M SYNTH. BOARD 124-000223 (4)	J-115L	L/M #1-3	L/M #2-5	L/M #1-16	L/M #2-19	L/M #3-15	L/M #1-7	L/M #2-10	L/M #1-21	L/M #2-23	L/M #3-16	L/M #1-9	L/M #2-11	L/M #1-22	L/M #2-24	L/M #3-4	L/M #2-2	L/M #2-15	L/M #1-13	L/M #2-20	L/M #3-2	L/M #1-24	L/M #2-13		
U/M SYNTH BOARD 124-000223-002 (2)	J-116U	N.C.	U/M #3-6	U/M #1-2	U/M #2-4	U/M #1-15	U/M #2-18	U/M #3-13	U/M #1-6	U/M #2-9	U/M #1-20	U/M #2-22	U/M #3-9	U/M #1-4	U/M #2-6	U/M #1-18	U/M #2-20	U/M #3-12	U/M #1-5	U/M #2-7	U/M #1-19	U/M #2-21	U/M #3-7		
L/M SYNTH. BOARD 124-000223 (4)	J-116L	N.C.	L/M #3-6	L/M #1-2	L/M #2-4	L/M #1-15	L/M #2-18	L/M #3-13	L/M #1-6	L/M #2-9	L/M #1-20	L/M #2-22	L/M #3-9	L/M #1-4	L/M #2-6	L/M #1-18	L/M #2-20	L/M #3-12	L/M #1-5	L/M #2-7	L/M #1-19	L/M #2-21	L/M #3-7		
U/M SYNTH. BOARD 124-000223-002 (2)	J-117U	N.C.	N.C.	N.C.	126-4	126-4 NOTE: 117U-4 THRU 15 via P-21/22-5	126-4	126-4	126-4	126-4	126-4	126-4	126-4	126-4	126-4	126-4	NOTE:	117U-4 THRU 15 via P-21/22-5						
L/M SYNTH. BOARD 124-000223 (4)	J-117L			J/T-1 via P-62/63 (-28V)																					
U/M SYN. PERC. BD. 124-000350 (11)	J-125	J-106-17 J-126-11	J-147-20	N.C.	N.C.	N.C.	J-147-5	J-127-3 via P-26/27	S-4-2	S-4-1	J-106-4	N.C.	S-2-1	S-1-4	S-1-6	S-10-4									
U/M SYN. PERC. BD. (11)	J-126	S-1-1	J-147-3	J-147-4 J-4	J-147-13 J-117U-4 THRU 15 VIA (P-21/22)	J/T -1 (-28V) P-35-3	S-19-6 P-22-1	J-147-1	J-106-21	J/T-5 (+25 V)	J-108U-3 via P-33/34	J-125-1	S-5-4	N.C.	S-9-2	J-106-2									
U/M PRE-SET BOARD 124-000351 (6)	J-127	N.C.	N.C.	J-125-7 via P-26/27	J-245U-1	POS. #8 U/M Tone/ Bar Assy.	J-245U-7	J-245U-2	J-245U-5	J-245U-3	J-245U-4	Pos. #1 U/M Tone/ Bar Return	U/M T/B 1'	U/M T/B 1-1/2'	U/M T/B 1-3/5'	U/M T/B 2'	U/M T/B 2-2/3'	U/M T/B 4'	U/M T/B 8'	U/M T/B 5-1/3'	U/M T/B 16'	N. C.	N.C.		
U/M PRE-SET BOARD 124-000351 (6)	J-128		P-36-3	P-36-1	P-36-2																				
U/M PRE-SET BOARD 124-000351 (6)	J-129	J-108L-1	J-108U-12	J-108U-11	J-108U-10	J-108U-9	J-108U-8	J-108U-7	J-108U-6	J-108U-5	J-108U-4	J-108U-22	J-108U-20												
L/M PRE-SET BOARD 124-000352 (7)	J-130	J-245L-5	J-245L-3	J-245L-4	N.C.	N.C.	Pos. #1 L/M Tone Bar Return	L/M T/B 1'	L/M T/B 1-1/3'	L/M T/B 1-3/5'	L/M T/B 2'	L/M T/B 2-2/3'	L/M T/B 4'	L/M T/B 8'	L/M T/B 5-1/3'	L/M T/B 16'									
L/M PRE-SET BOARD 124-000352 (7)	J-131	J-108U-1 J/T #3 (-14 V)	J-108L-12	J-108L-11	J-108L-10	J-108L-9	J-108L-8	J-108L-7	J-108L-6	J-108L-5	J-108L-4	J-108L-22	J-108L-21												
CONNECTOR	P 111 / P 112	J-245-6 / J-141-8																							
CONNECTOR	P 114 / P 115	S-25-1 / J-144-2	S-25-4 / J-144-1	S-25-5 / J-145-11	S-23-4 / J-145-10	S-22-2 / J-145-9 J-150-1	N.C. / N.C.	S-18-4 / J-145-2	S-18-5 / J-145-8	S-16-6 / J-144-8	N.C. / N.C.	N.C. / J-145-3	N.C. / J-144-5 J-143-15	N.C. / N.C.	S-17-6 / P-79-6	S-16-4 / J-143-12									

NOTE:
REFER TO PLUG AND CONNECTOR LOCATIONS PAGE 2-26 AND 2-27

FIGURE 3-60
PLUG AND PIN NUMBERS
WIRING CHART
(J-115L THRU J-131)

PLUG AND PIN NUMBERS WIRING CHART OF 16100 SERIES ORGAN

	PLUG NO.	PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
STAIRCASE WAVE PERC. BOARD 124-000340 (3)		BOARD PLUGS INTO MOTHER BOARD 124-000223-C02																							
L/M SYNTHESIS DAUGHTER BOARD 124-000341 (5)		BOARD PLUGS INTO MOTHER BOARD 124-000223																							
AUTO-ACCOMP BOARD 124-000424 (17)	J-141	J-104-2	J-2-12	J/T-2 (Gnd. #2)	J/T-4 (Gnd. #1)	J-144-4 J-2-8	J-104-21 J-1-1	J-1-7	P-112	N.C.	N.C.	J-1-12	J-1-9												
AUTO-ACCOMP. BOARD 124-000424 (17)	J-142	P-33-4	J-104-22 J-150-3	J-104-19	P-33-1	P-87	J-1-6	PED. TERM. STRIP			J-104-2	N. C.	16' PED TERM. STRIP												
MIXER #2 BOARD 124-000376 (15)	J-143	J-143-9	P-43-15	P-43-10	P-43-13	P-66-6	P-12-2	J-145-4	P-12-1	J-143-1	J-104-10	N.C.	P-115-15	J-145-16	J-149-6	P-115-12									
MIXER #1 BOARD 126-000374 (15)	J-144	P-115-2	P-115-1	J-142-22 J-104-22	P-46-6 J-144-5	P-115-12	J-143-14	P-12-3	P-115-9	J-2-1	P-33-6	N.C.	P-43-4 J-150-5												
MIXER #3 BOARD 124-000377 (16)	J-145	J-255-9	P-115-7	P-115-11	J-143-7	J-150-7	N.C.	N.C.	P-115-8	P-115-5	P-115-4	P-115-3	N.C.	N.C.	P-43-3	N.C.	J-143-13 J-150-6	N.C.	N.C.	P-4-3 via P-79/80-8	J-255-8 via P-79/80-3	J-254-9 via P-79/80-1	J/T 5 (+25 V) J-144-3		
MDD GENERATOR BOARD 124-000265 (1)	J-146	N.C.	J-16-6 via P-21/22-1	S-21-5	S-20-3	S-20-4	N.C.	J/T-2 (#2 GND)	J/T-3 (-14 V)	J/T-1 (-28 V)	J-110-3	J-110-12	J-110U-11	J-110U-10	J-110U-9	J-110U-8	J-110U-7	J-110U-6	J-110U-5	J-110U-4	J-110U-3	J-110U-2	J-110U-1	N.C.	N.C.
REPEAT OSC. AND DETECTOR BOARD 124-000353 (12)	J-147	J-126-7 J-147-7	N.C.	J-126-2	J-126-3	J-125-6	N.C.	J/T-3 (-14 V) J-147-1	S-1-3	N.C.	N.C.	S-4-4	P-34-1	J-126-4	J-128-2 via P35/36-3	U/M #1-8 via P-83/84	J/T-2 (GND #2)	To Re-peat Pot.	To Re-peat Pot	S-21-4	J-125-2	S-11-2	N.C.		
REVERB AMP. ED. 124-000166	J-150	P-115-5	N.C.	J-142-2	N.C.	J-144-12	J-145-16	J-145-5	N.C.	N.C.															
UPPER MANUAL PISTON PRESETS	J-245U	J-127-4	J-127-7	J-127-9	J-127-10	J-127-8	J-106-3 S-10-6 via P-108/109	J-127-6	N.C.	N.C.															
LOWER MANUAL PISTON PRESETS	J-245L	N.C.	N.C.	J-130-2	J-130-3	J-130-1	J/T #6 (-8 V)	Pos. 8 L/M Tone Var. Assy.	N.C.	N.C.															
POWER AMP. 126-000117	J-254	P-4-5	P-4-4	N.C.	TERM. ST. #4	N.C.	N.C.	J/T #4 (Gnd. #1)	P-80-4	P-80-1															
POWER AMP. 126-000117	J-255	P-4-5	P-4-4	N.C.	TERM. ST. #9	N.C.	P-2-6	J/T #4 (Gnd. #1)	P-80-3	P-80-2															

NOTE:
REFER TO PLUG AND CONNECTOR LOCATIONS PAGE 2-26 AND 2-27

FIGURE 3-61
PLUG AND PIN NUMBER WIRING CHART (J-141 THRU J-255)

SECTION IV
PARTS LIST

GRANDEE - 11,000 SERIES

INDEX

CONSOLE (FULL FRONT VIEW) 4-3
Top & Music Pannel Assy.
Stop Switch Base Assy.
Upper & Lower End Blocks
Front Strip & Arpeggiator Assy.
Pedal Switch Assy.
Expression Pedal Assy.
Bench
Clavier
Panel & Grille Cloth Assy.
Case Assy.
Control Panel Assy.
Auto Vari-64
Rhythm Control Panel Assy.

PEDAL KEYBOARD ASSY. (TOP VIEW) 4-3
Black Pedal Assy.
White Pedal Assy.
Moulding
Pivot Rod
Hinge Spring

PEDAL KEYBOARD (BOTTOM VIEW) 4-4
Up & Down Felts
Pusher Springs
Stretcher
Guide & Felt Foot

KEY AND SPRING ASSY. 4-4
Actuator
Clamp Strips & Screws

SWELL PEDAL ASSY. (EXPOSED) 4-5
Pedal & Mat
Photo Cell Assy.
Lamp
Cable & Socket Assy.

PEDAL SWITCH ASSY (EXPOSED) 4-5
Switch Guides
Spring Returns
Actuators
Spring Contact

UPPER CONSOLE (FRONT VIEW) 4-6
Knobs & Push Buttons (Auto Vari)
Potentiometer & A.C. Switch
Piston Switch Assys.
Tone Bar Assemblies
Arpeggiator Assembly

UPPER FRONT VIEW (TOP UP) 4-6
Auto Vari -64
Piston Switch Assemblies
Upper & Lower Keyboard
Rod & Bolt Assembly
Chain Assembly
Music Lamp Cable

TONE BAR ASSEMBLY (PEDAL) 4-7
Printed Network
Stop Channel
Contact Spring

TAB & SWITCH ASSEMBLY 4-8
Tab (Only)
Switch Assembly
Pivot Shaft
Speed Nut
Detent Spring

UPPER FRONT VIEW (EXPOSED) 4-9
Manual PWB's
Upper Manual Syn. Perc. Bd. (124-000350)
Bright Perc. Filter Bd. (124-000208)
Auto Accomp. Bd. (124-000360)
Pedal Filter Bd. (124-000206)
Mixer #2 Bd. (124-000374)
Misc. Board (124-000365)
Mixer #3 Bd. (124-000377)
Cassette Strip
Phone Jack & Term. Strip Assy.
Up Stop & Down Stop Felt

AUTO VARI - 64 4-9
Potentiometers & Knobs
Rotary Switch

AUTO VARI - 64 CONTINUED 4-9
Slide Switch
Push Buttons & Tab Switch Assy.
Voicing Board (124-000380)
Pattern Generator Bd. (124-000379)
Variations Bd. (124-000418)

CONSOLE (FULL REAR VIEW) 4-10
Sine Wave Filter Board (124-000202)
Sine Wave Filter Board (124-000201)
Sine Wave Filter Board (124-000204)
Tremolo Assy.
Power Amp. Assy.
Housing Assy.
Reverb Assy. (124-000166)
380 Cover Assy.
Stair Case Wave Perc.Bd. (124-000340)
Mother Board (124-000223-002)
MDD Generator Bd. (124-000265)
Speakers

CONSOLE REAR VIEW (EXPOSED) 4-10
Pedal Filter Bd. (124-000206)
Mixer Bd. #2 (124-000374)
Mixer Bd. #3 (124-000377)
Misc. Bd. (124-000365)
380 Daughter Bd. (124-000341)
380 Mother Bd. (124-000223)
Arpeggiator Bd. (124-047850)
U/M Preset Bd. (124-000351)
L/M Preset Bd. (124-000352)
Repeat Osc. & Det. Bd. (124-000353)
Bright Perc. Filter (124-000208)
U/M Syn. Perc. Board (124-000350)
Auto Accomp. Bd. (124-000360)

AMPLIFIER (TOP VIEW) 4-11
Power Supply Board (124-000209)
Heat Sink & PWB Assy.
Power Transistor
Power Transformer
Chassis Pan Assy.
Music Lite Transformer
Fuses

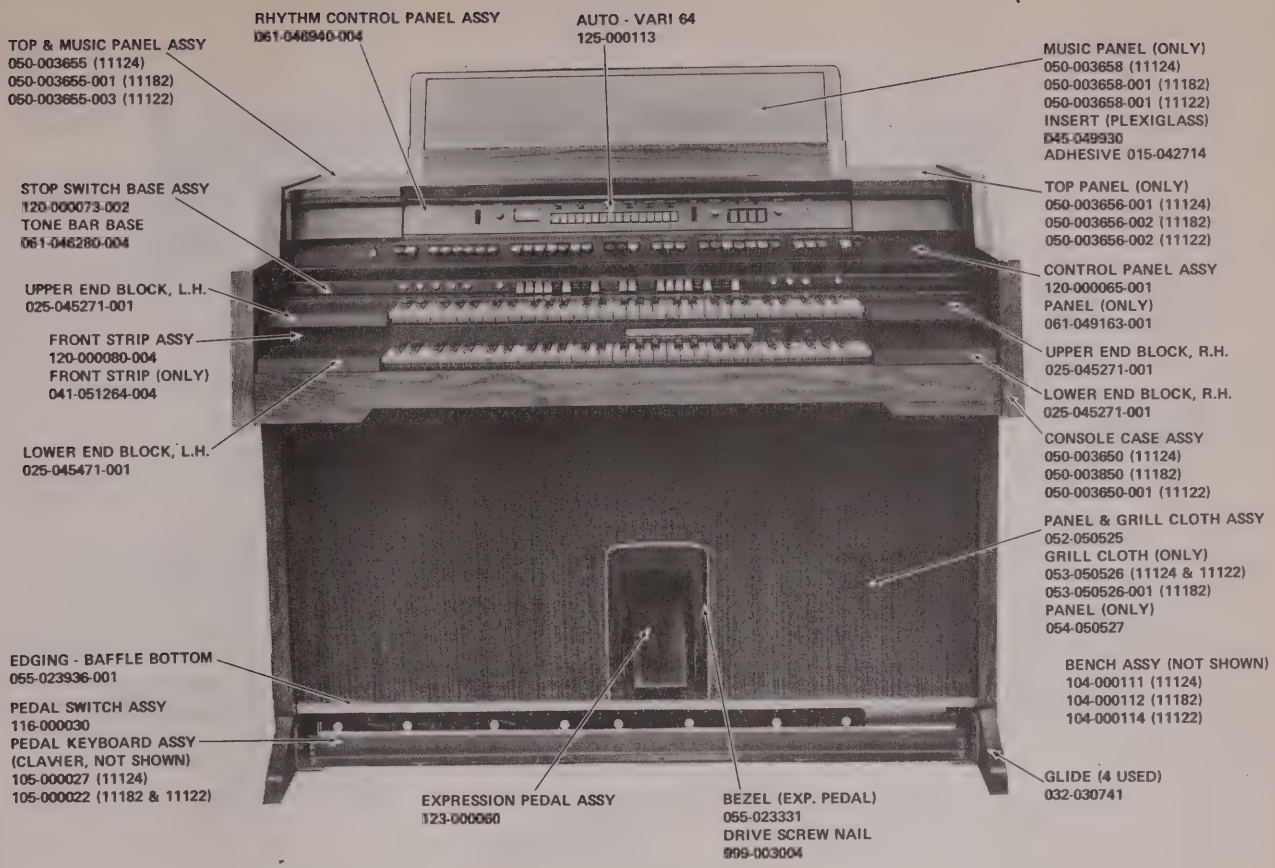
35 WATT AMP MODULE 4-11
Heat Sink
Power Transistor
35 Watt Amp. Board (124-000169)

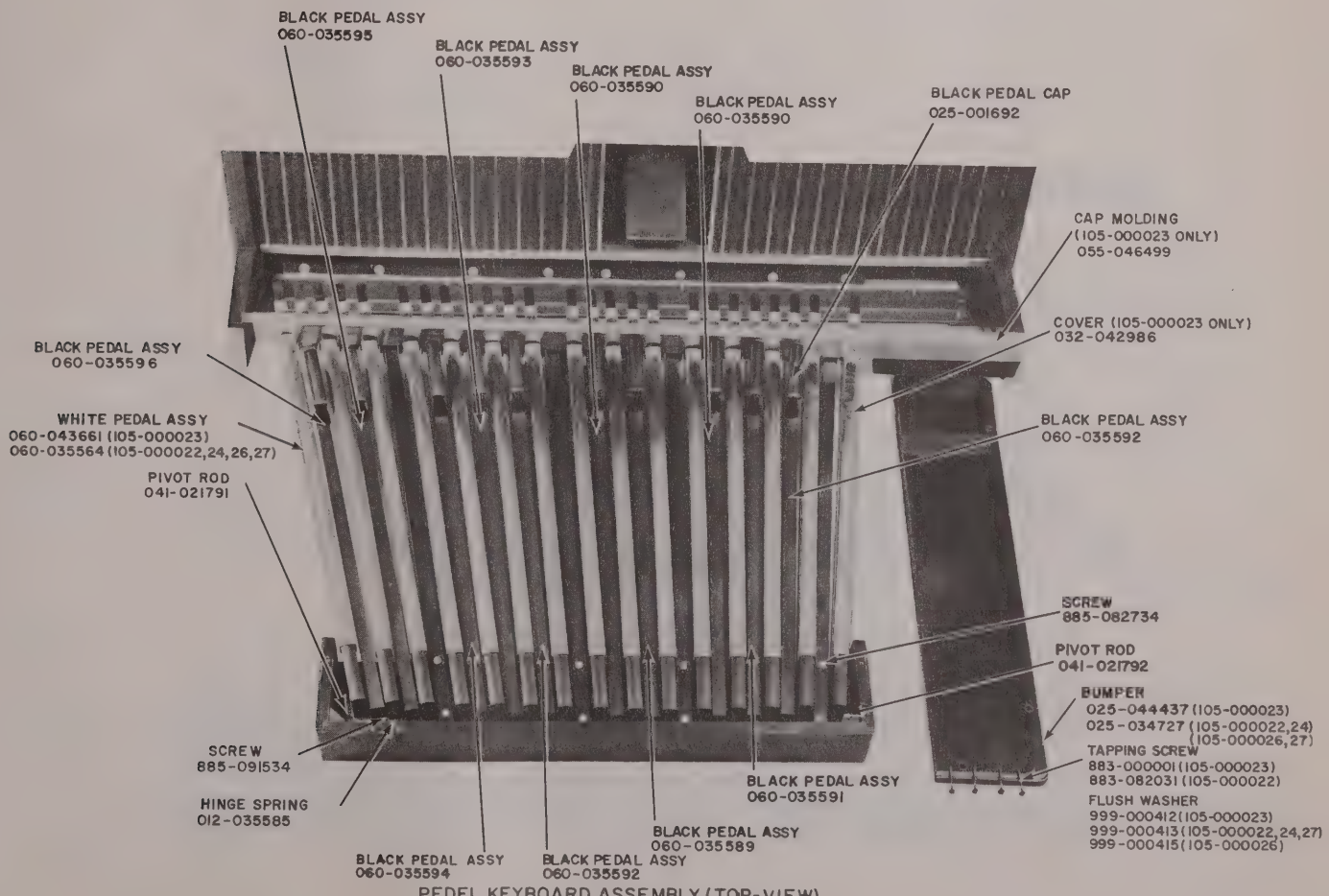
AMPLIFIER (BOTTOM VIEW) 4-12
Rectifier & Relay Bd. (124-000355)
Power Supply Board (124-000209)
35 Watt Amp Bd. (124-000169)

TREMOLO ASSEMBLY (REAR VIEW) 4-12
Drive Assy.
Speaker
Pad
Baffle
Rotor & Bracket Assy.

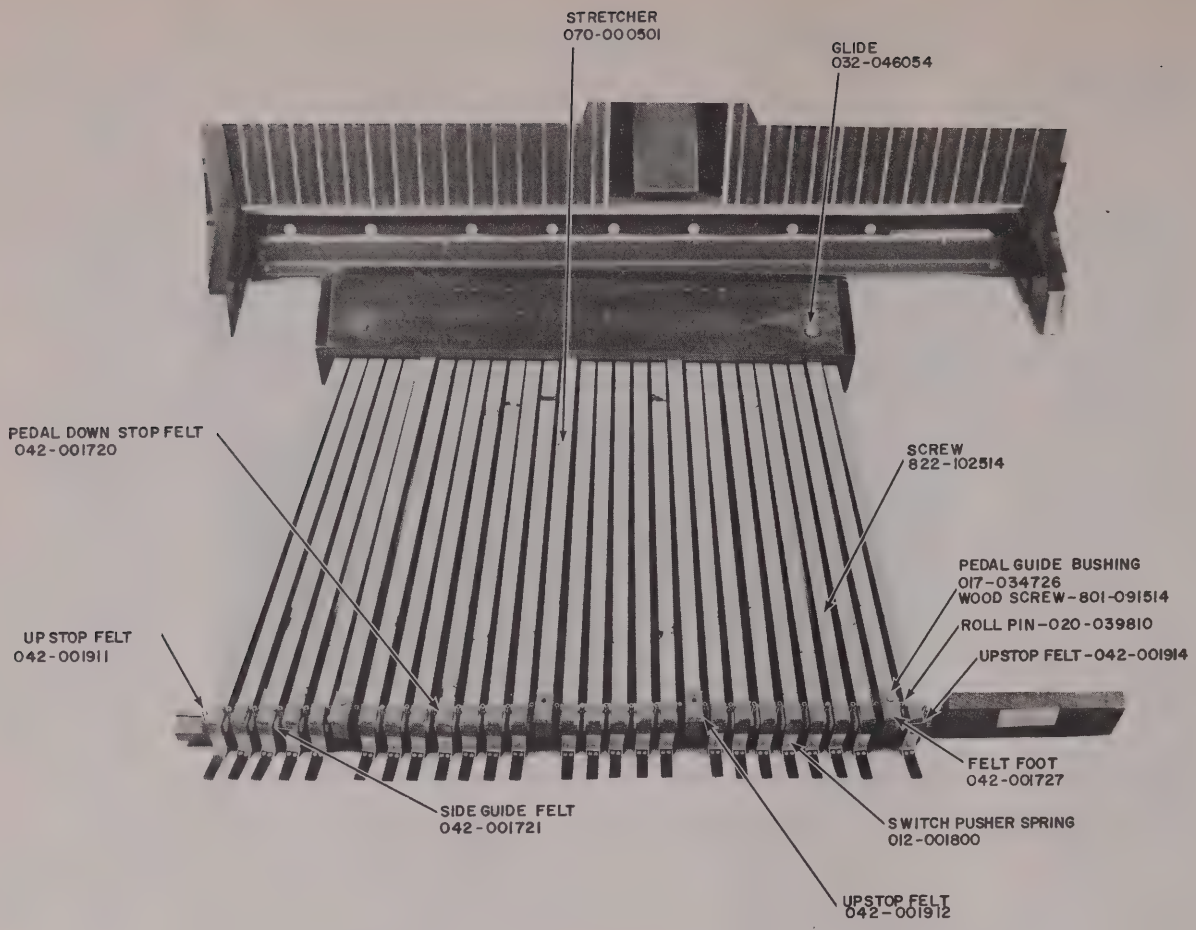
TREMOLO ASSEMBLY (FRONT VIEW) 4-13
Drive Assembly
Belt
Bracket & Bearing Assy.
Motor & Pulley

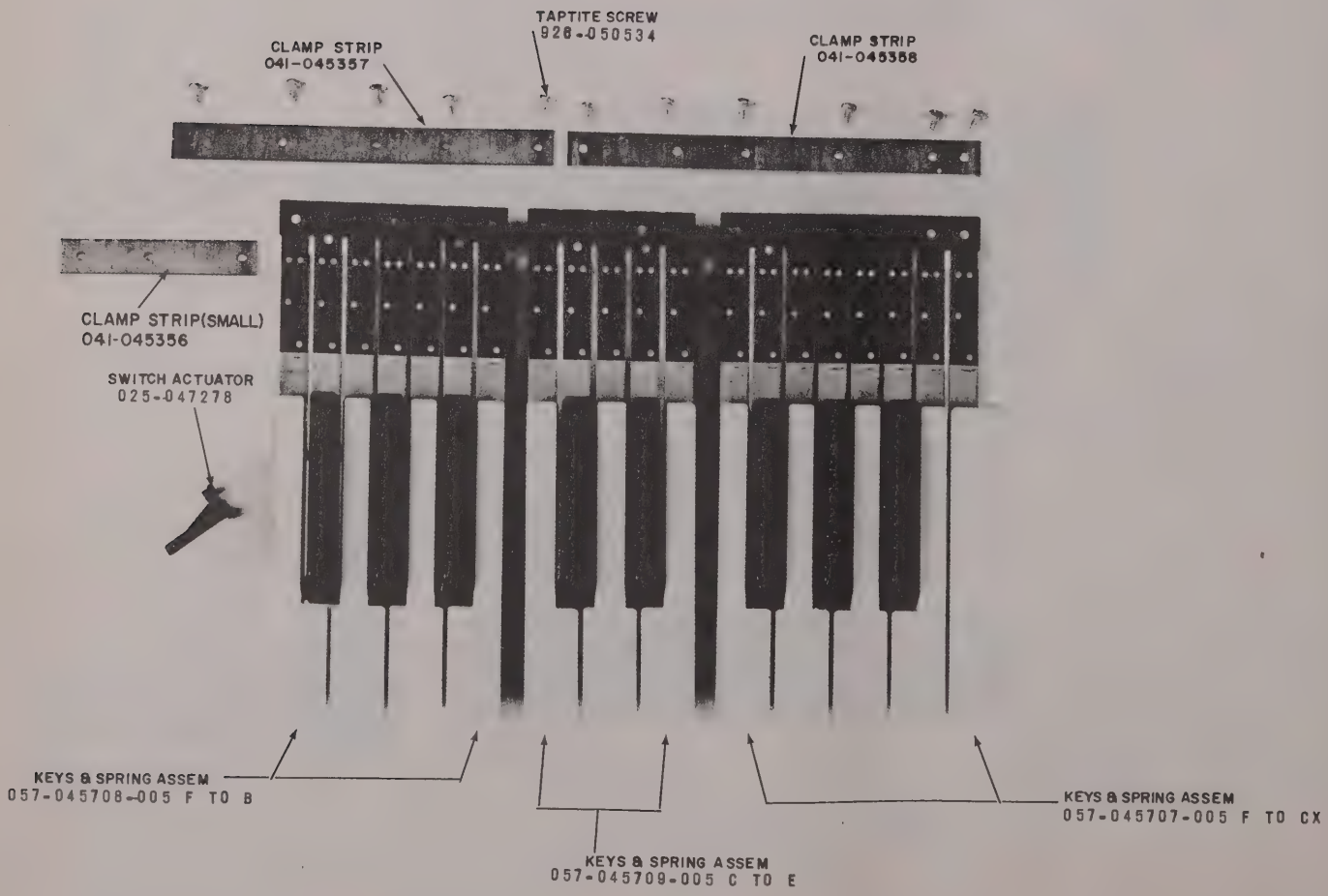
PRINTED WIRING BOARDS
Parts List 4-21

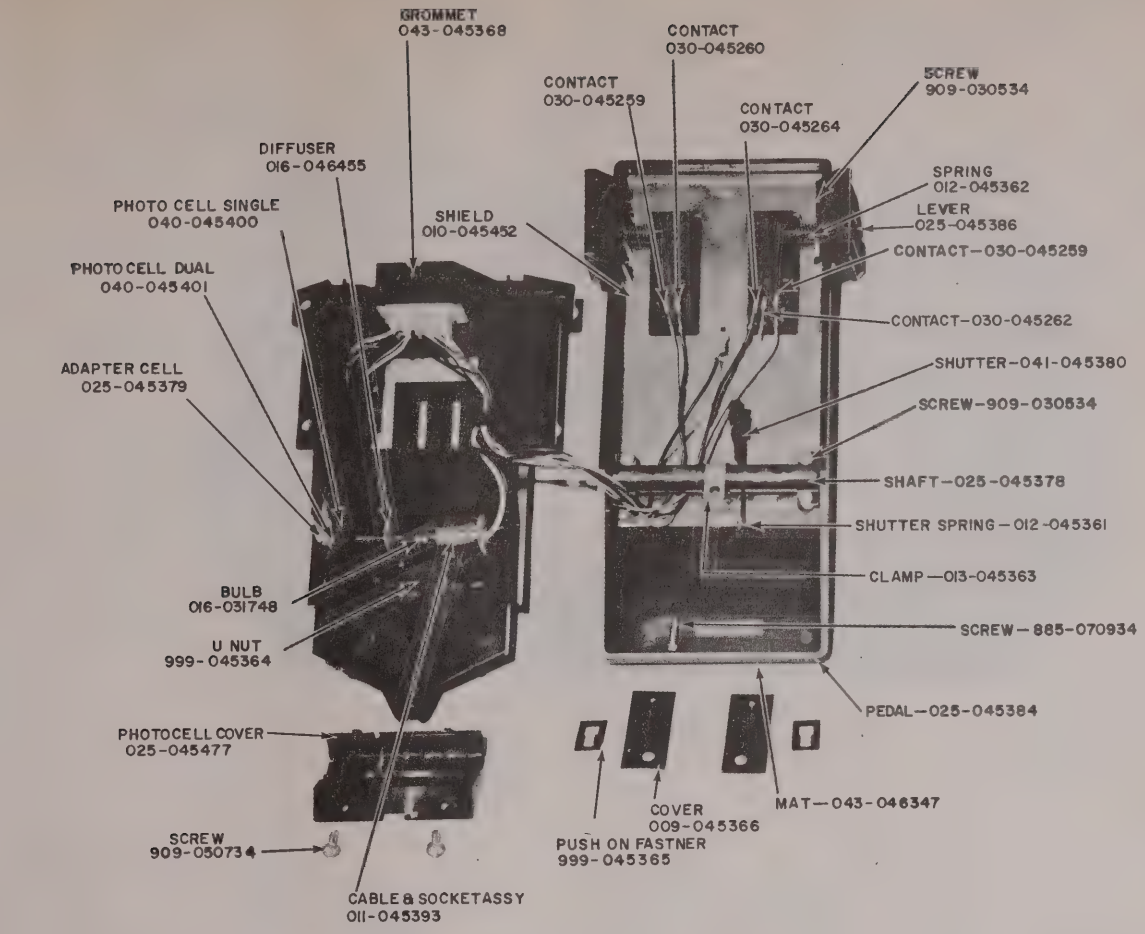


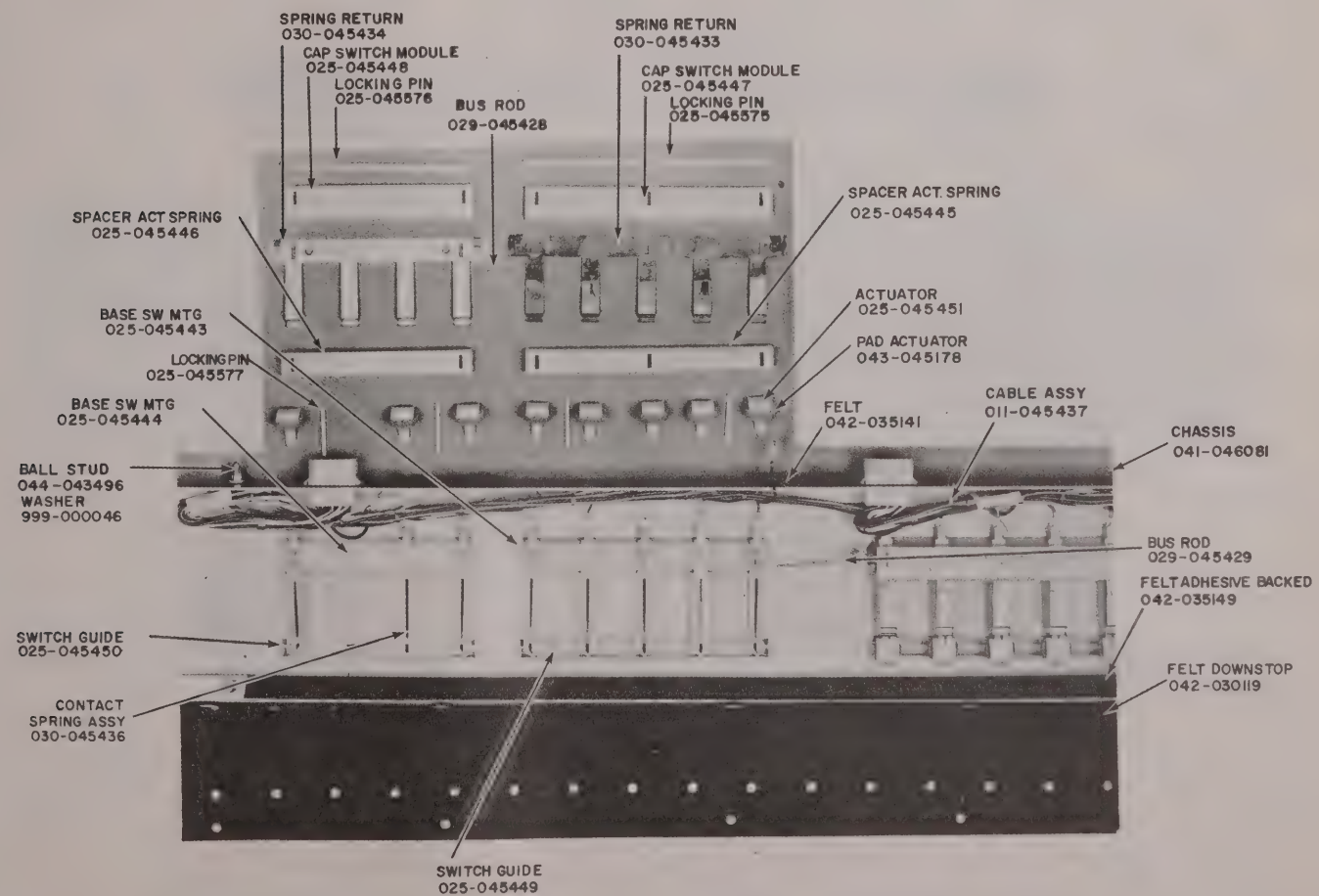


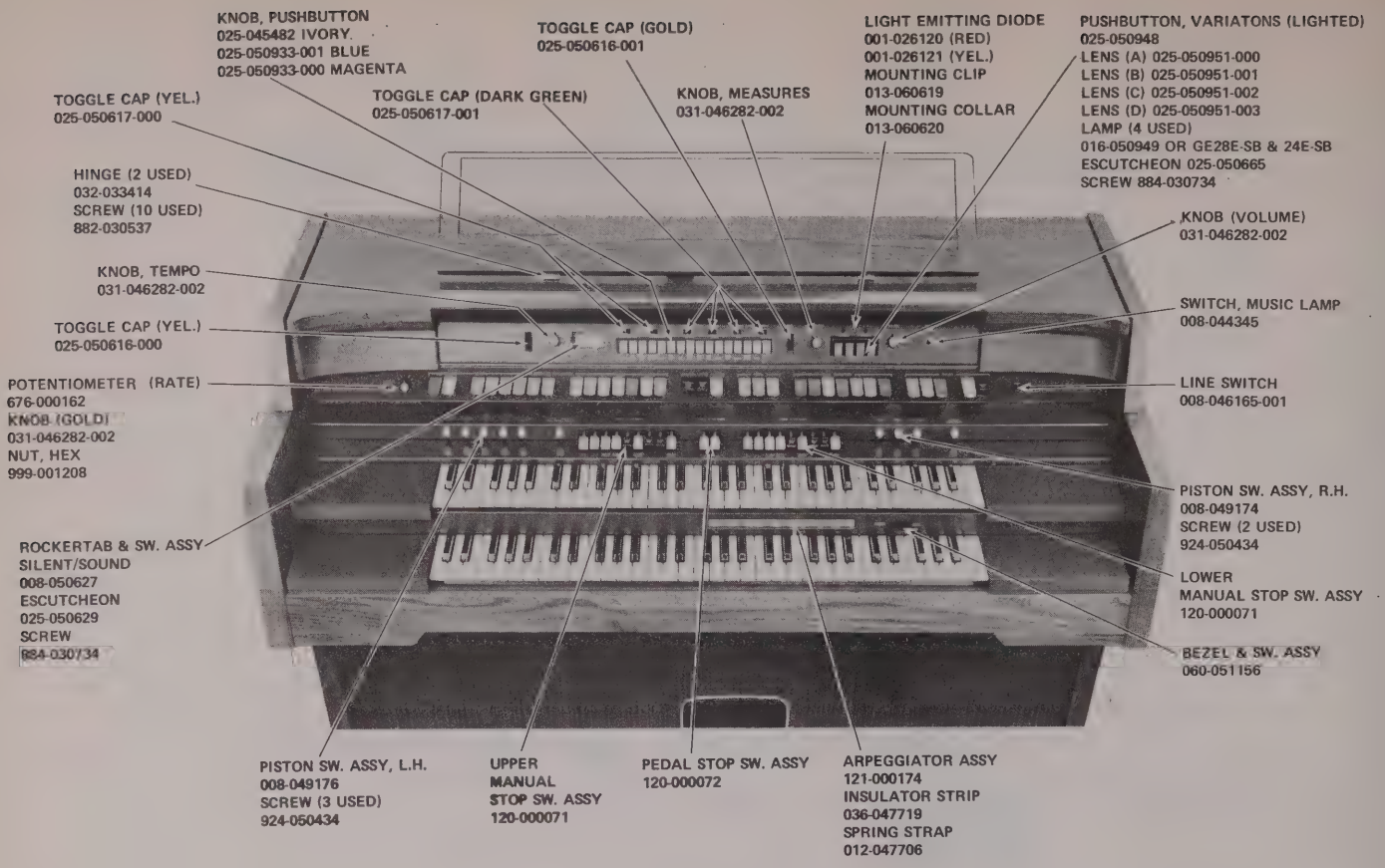
PEDEL KEYBOARD ASSEMBLY (TOP-VIEW)

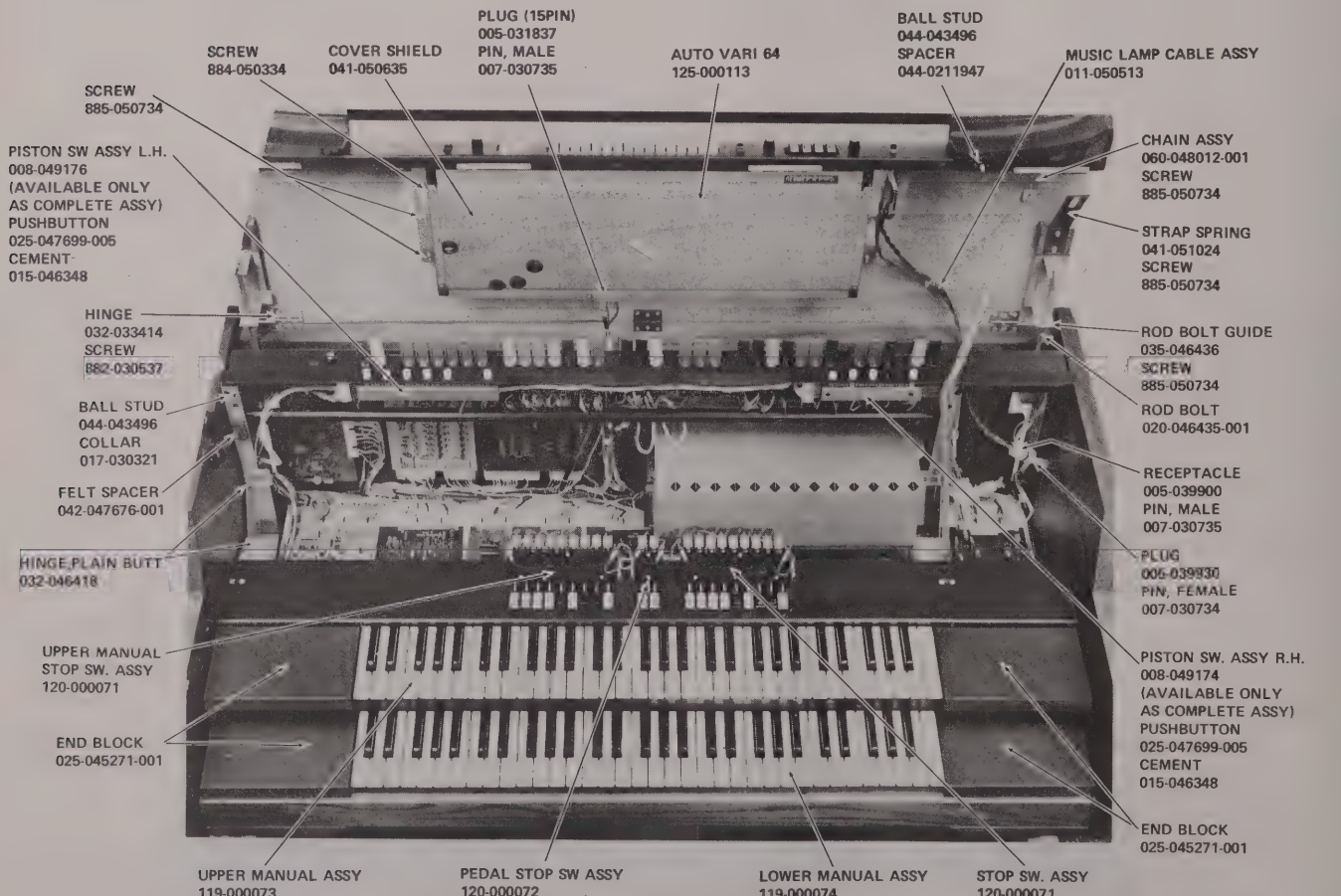

STRETCHER
070-000501
GLIDE
032-046054
PEDAL DOWN STOP FELT
042-001720
SCREW
822-102514
PEDAL GUIDE BUSHING
017-034726
WOOD SCREW-801-091514
ROLL PIN-020-039810
UPSTOP FELT-042-001914
UP STOP FELT
042-001911
FELT FOOT
042-001727
SIDE GUIDE FELT
042-001721
SWITCH PUSHER SPRING
012-001800
UPSTOP FELT
042-001912

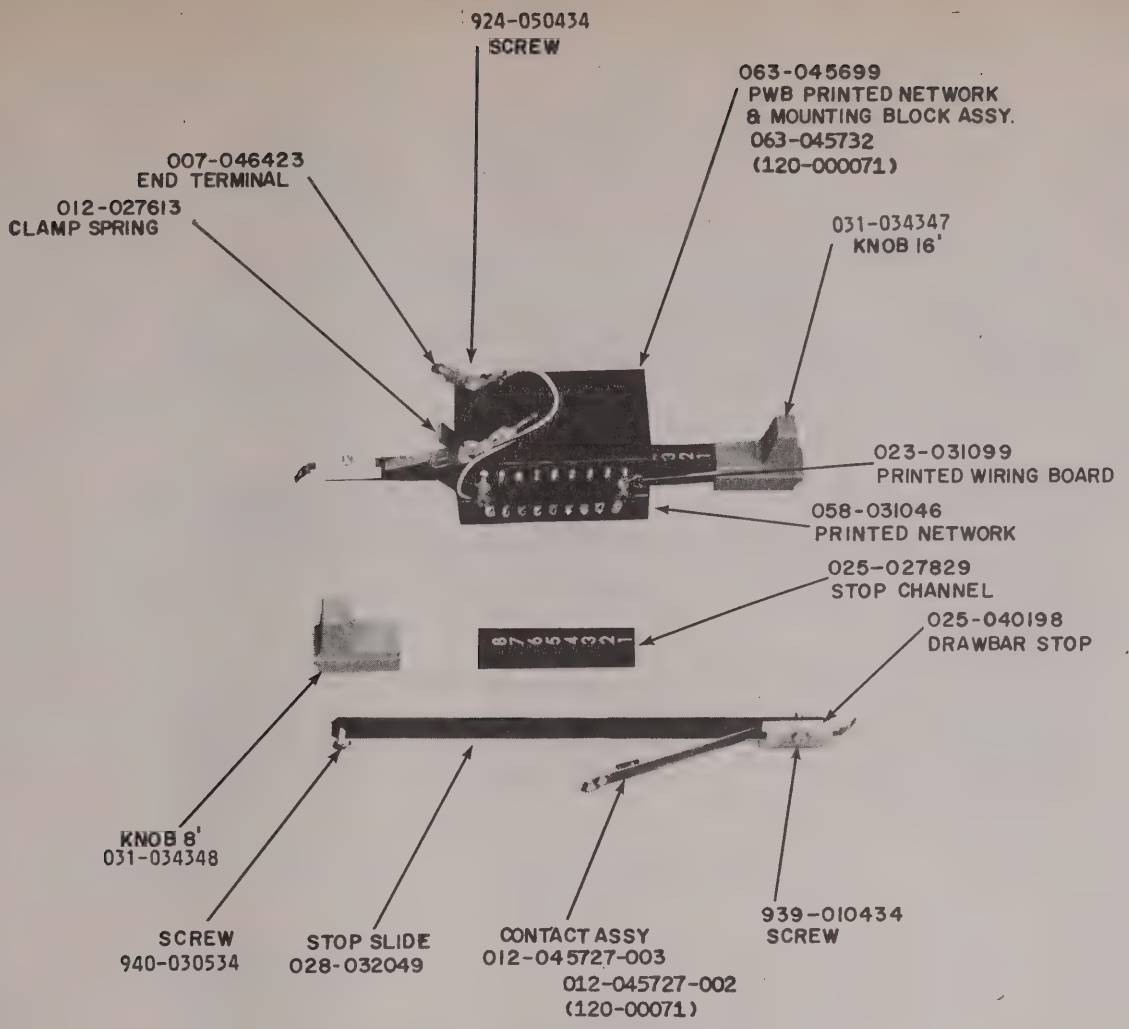

TAPTITE SCREW
926-050534
CLAMP STRIP
041-045357
CLAMP STRIP
041-045358
CLAMP STRIP(SMALL)
041-045356
SWITCH ACTUATOR
025-047278
KEYS & SPRING ASSEM
057-045708-005 F TO B
KEYS & SPRING ASSEM
057-045709-005 C TO E
KEYS & SPRING ASSEM
057-045707-005 F TO CX


GROMMET
043-045368
CONTACT
030-045260
CONTACT
030-045259
CONTACT
030-045264
SCREW
909-030534
DIFFUSER
016-046455
SPRING
012-045362
PHOTO CELL SINGLE
040-045400
SHIELD
010-045452
LEVER
025-045386
PHOTO CELL DUAL
040-045401
CONTACT-030-045259
CONTACT-030-045262
ADAPTER CELL
025-045379
SHUTTER-041-045380
SCREW-909-030534
SHAFT-025-045378
SHUTTER SPRING-012-045361
CLAMP-013-045363
BULB
016-031748
SCREW-885-070934
U NUT
999-045364
PEDAL-025-045384
PHOTOCELL COVER
025-045477
MAT-043-046347
COVER
009-045366
SCREW
909-050734
PUSH ON FASTNER
999-045365
CABLE & SOCKET ASSY
011-045393

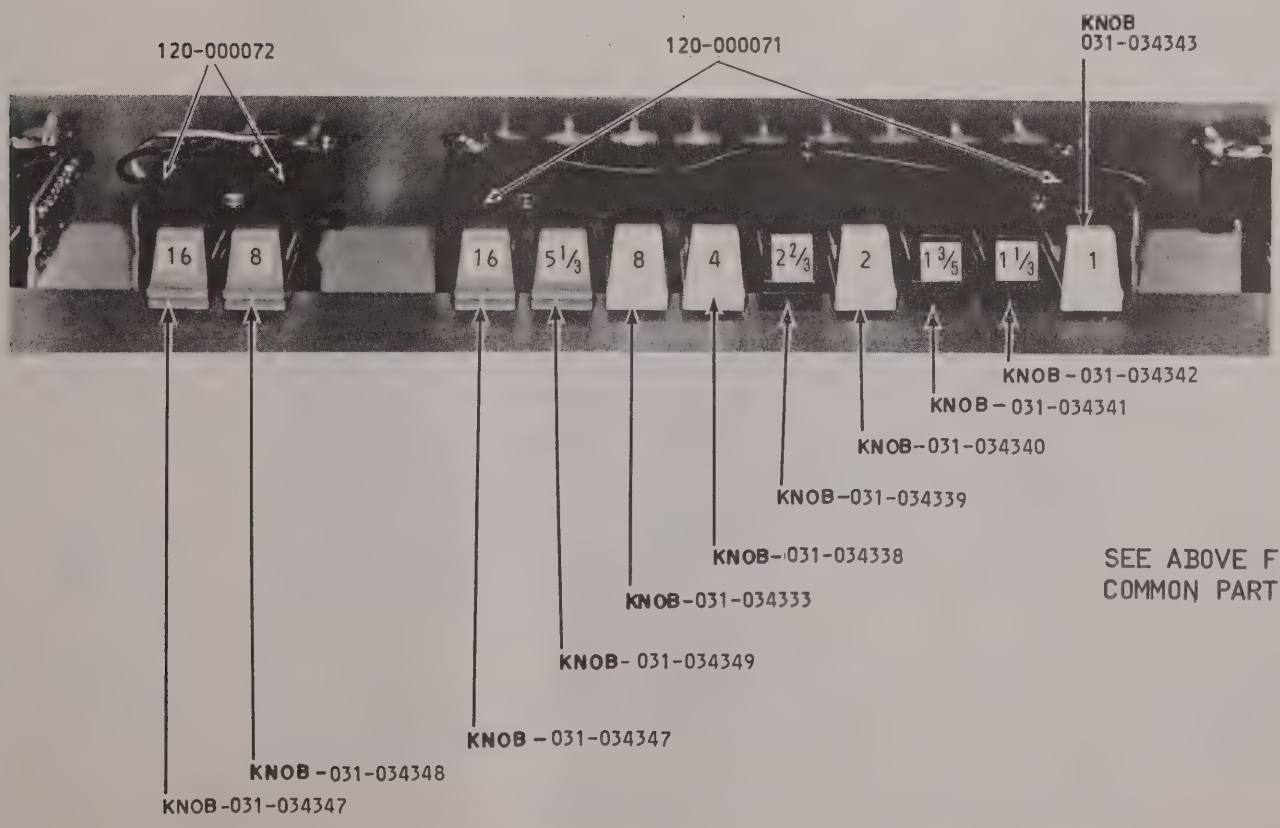

SPRING RETURN
030-045434
SPRING RETURN
030-045433
CAP SWITCH MODULE
025-045448
CAP SWITCH MODULE
025-045447
LOCKING PIN
025-045576
BUS ROD
029-045428
LOCKING PIN
025-045575
SPACER ACT SPRING
025-045446
SPACER ACT SPRING
025-045445
ACTUATOR
025-045451
BASE SW MTG
025-045443
PAD ACTUATOR
043-045178
LOCKING PIN
025-045577
BASE SW MTG
025-045444
FELT
042-035141
CABLE ASSY
011-045437
CHASSIS
041-046081
BALL STUD
044-043496
WASHER
999-000046
BUS ROD
029-045429
FELT ADHESIVE BACKED
042-035149
SWITCH GUIDE
025-045450
FELT DOWNSTOP
042-030119
CONTACT
SPRING ASSY
030-045436
SWITCH GUIDE
025-045449


KNOB, PUSHBUTTON
025-045482 IVORY
025-050933-001 BLUE
025-050933-000 MAGENTA
TOGGLE CAP (GOLD)
025-050616-001
LIGHT EMITTING DIODE
001-026120 (RED)
001-026121 (YEL.)
MOUNTING CLIP
013-060619
MOUNTING COLLAR
013-060620
PUSHBUTTON, VARIATONS (LIGHTED)
025-050948
LENS (A) 025-050951-000
LENS (B) 025-050951-001
LENS (C) 025-050951-002
LENS (D) 025-050951-003
LAMP (4 USED)
016-050949 OR GE28E-SB & 24E-SB
ESCUTCHEON 025-050665
SCREW 884-030734
TOGGLE CAP (YEL.)
025-050617-000
TOGGLE CAP (DARK GREEN)
025-050617-001
KNOB, MEASURES
031-046282-002
HINGE (2 USED)
032-033414
SCREW (10 USED)
882-030537
KNOB (VOLUME)
031-046282-002
KNOB, TEMPO
031-046282-002
SWITCH, MUSIC LAMP
008-044345
TOGGLE CAP (YEL.)
025-050616-000
POTENTIOMETER (RATE)
676-000162
KNOB (GOLD)
031-046282-002
NUT, HEX
999-001208
LINE SWITCH
008-046165-001
PISTON SW. ASSY, R.H.
008-049174
SCREW (2 USED)
924-050434
ROCKERTAB & SW. ASSY
SILENT/SOUND
008-050627
ESCUTCHEON
025-050629
SCREW
884-030734
LOWER
MANUAL STOP SW. ASSY
120-000071
BEZEL & SW. ASSY
060-051156
PISTON SW. ASSY, L.H.
008-049176
SCREW (3 USED)
924-050434
UPPER
MANUAL
STOP SW. ASSY
120-000071
PEDAL STOP SW. ASSY
120-000072
ARPEGGIATOR ASSY
121-000174
INSULATOR STRIP
036-047719
SPRING STRAP
012-047706

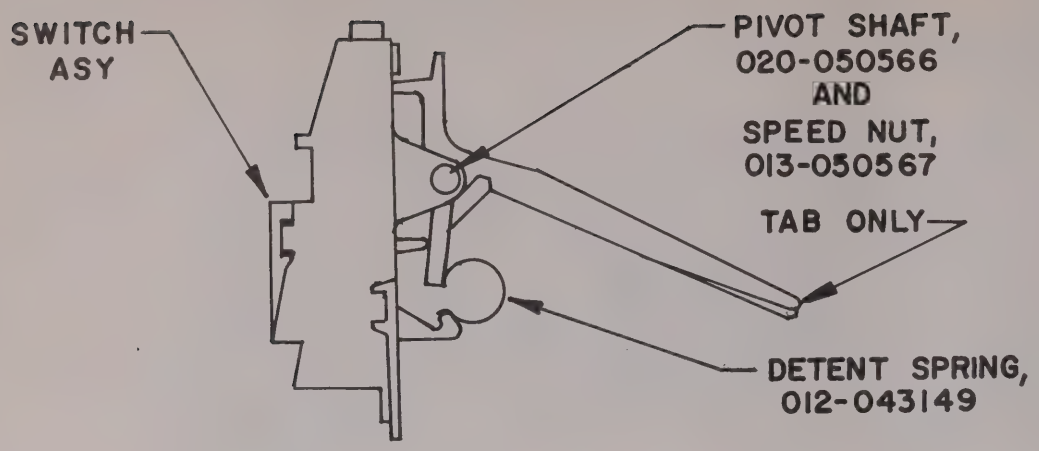

PLUG (15PIN)
005-031837
PIN, MALE
007-030735
BALL STUD
044-043496
SPACER
044-0211947
SCREW
884-050334
COVER SHIELD
041-050635
AUTO VARI 64
125-000113
MUSIC LAMP CABLE ASSY
011-050513
SCREW
885-050734
PISTON SW ASSY L.H.
008-049176
(AVAILABLE ONLY
AS COMPLETE ASSY)
PUSHBUTTON
025-047699-005
CEMENT
015-046348
CHAIN ASSY
060-048012-001
SCREW
885-050734
STRAP SPRING
041-051024
SCREW
885-050734
HINGE
032-033414
SCREW
882-030537
ROD BOLT GUIDE
035-046436
SCREW
885-050734
ROD BOLT
020-046435-001
BALL STUD
044-043496
COLLAR
017-030321
FELT SPACER
042-047676-001
RECEPTACLE
005-039900
PIN, MALE
007-030735
HINGE,PLAIN BUTT
032-046418
PLUG
005-039930
PIN, FEMALE
007-030734
UPPER MANUAL
STOP SW. ASSY
120-000071
PISTON SW. ASSY R.H.
008-049174
(AVAILABLE ONLY
AS COMPLETE ASSY)
PUSHBUTTON
025-047699-005
CEMENT
015-046348
END BLOCK
025-045271-001
END BLOCK
025-045271-001
UPPER MANUAL ASSY
119-000073
PEDAL STOP SW ASSY
120-000072
LOWER MANUAL ASSY
119-000074
STOP SW. ASSY
120-000071



TONEBAR ASSEMBLY (PEDAL)
120-000072

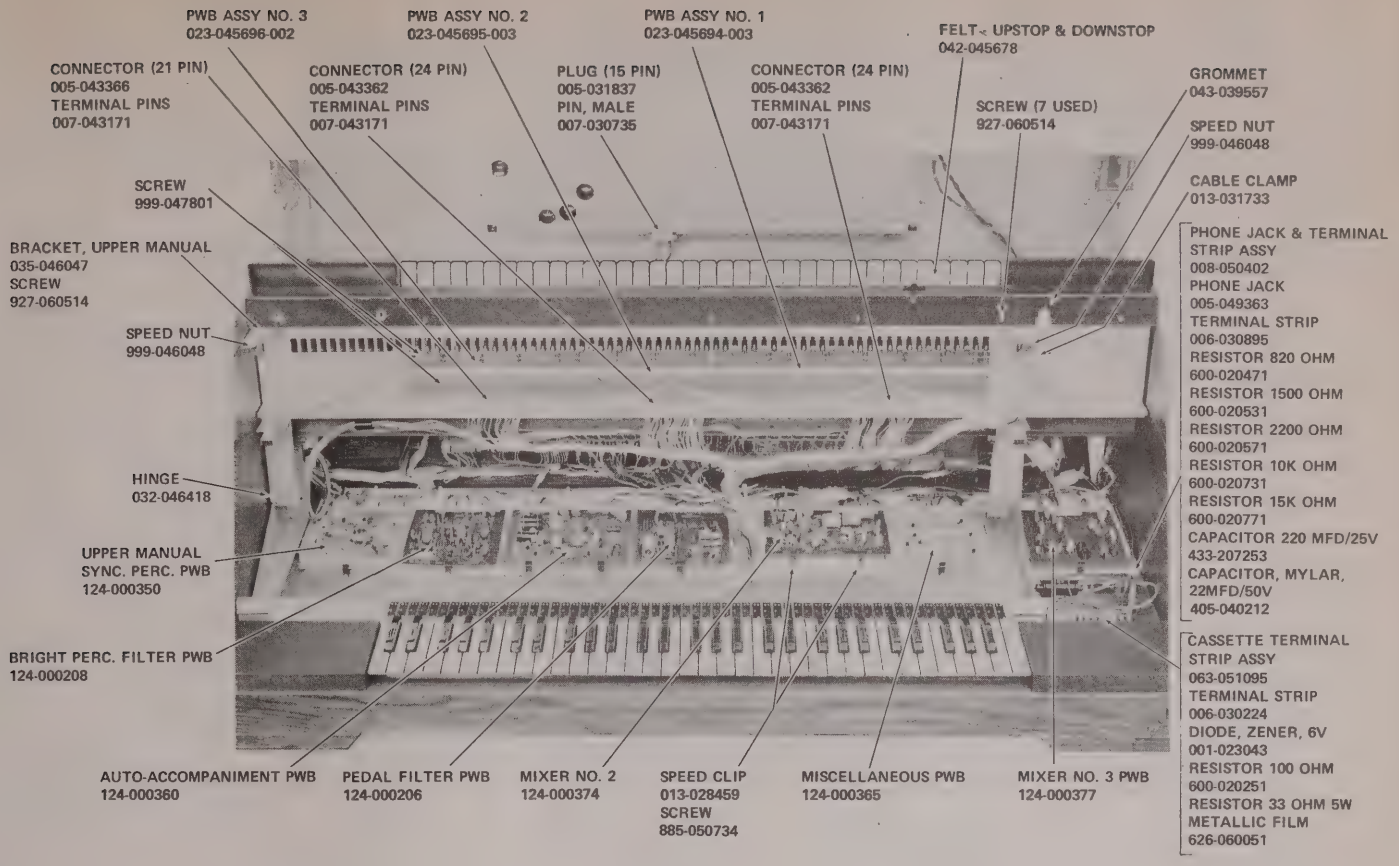


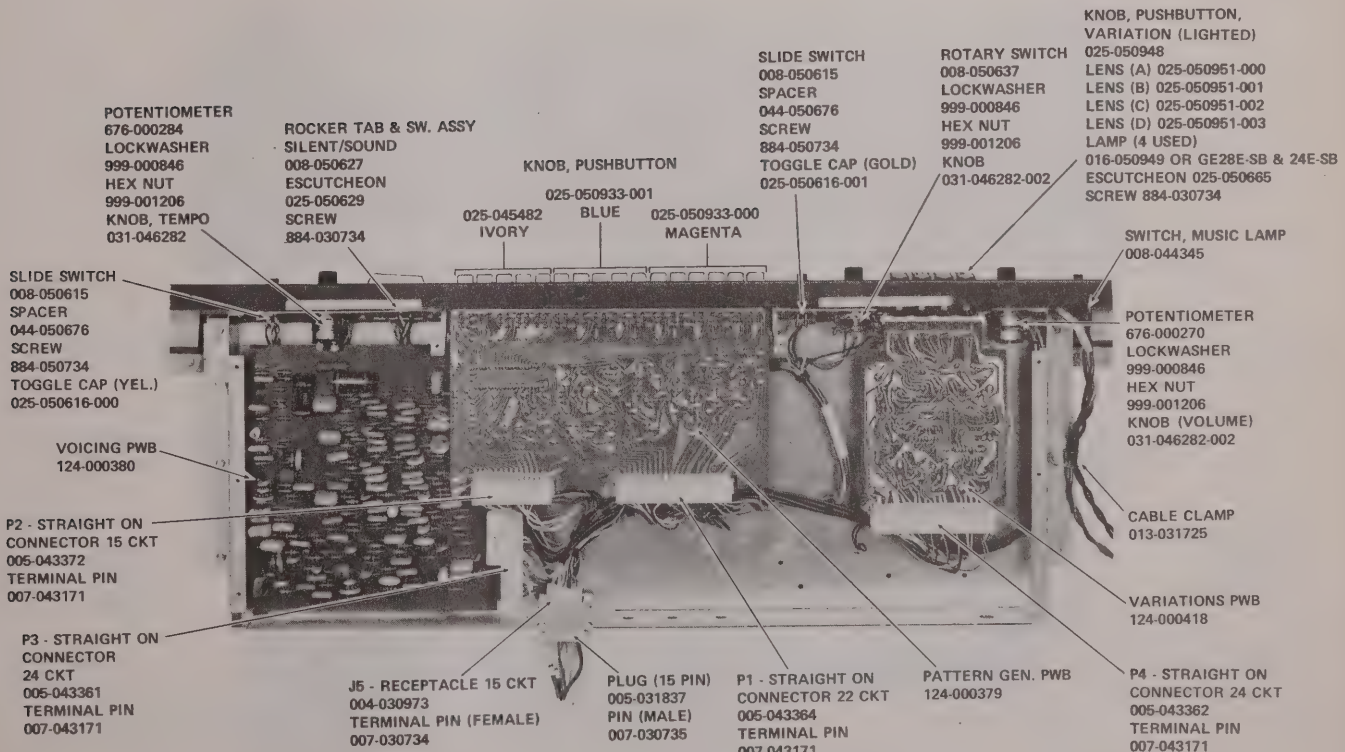
SEE ABOVE FOR
COMMON PARTS



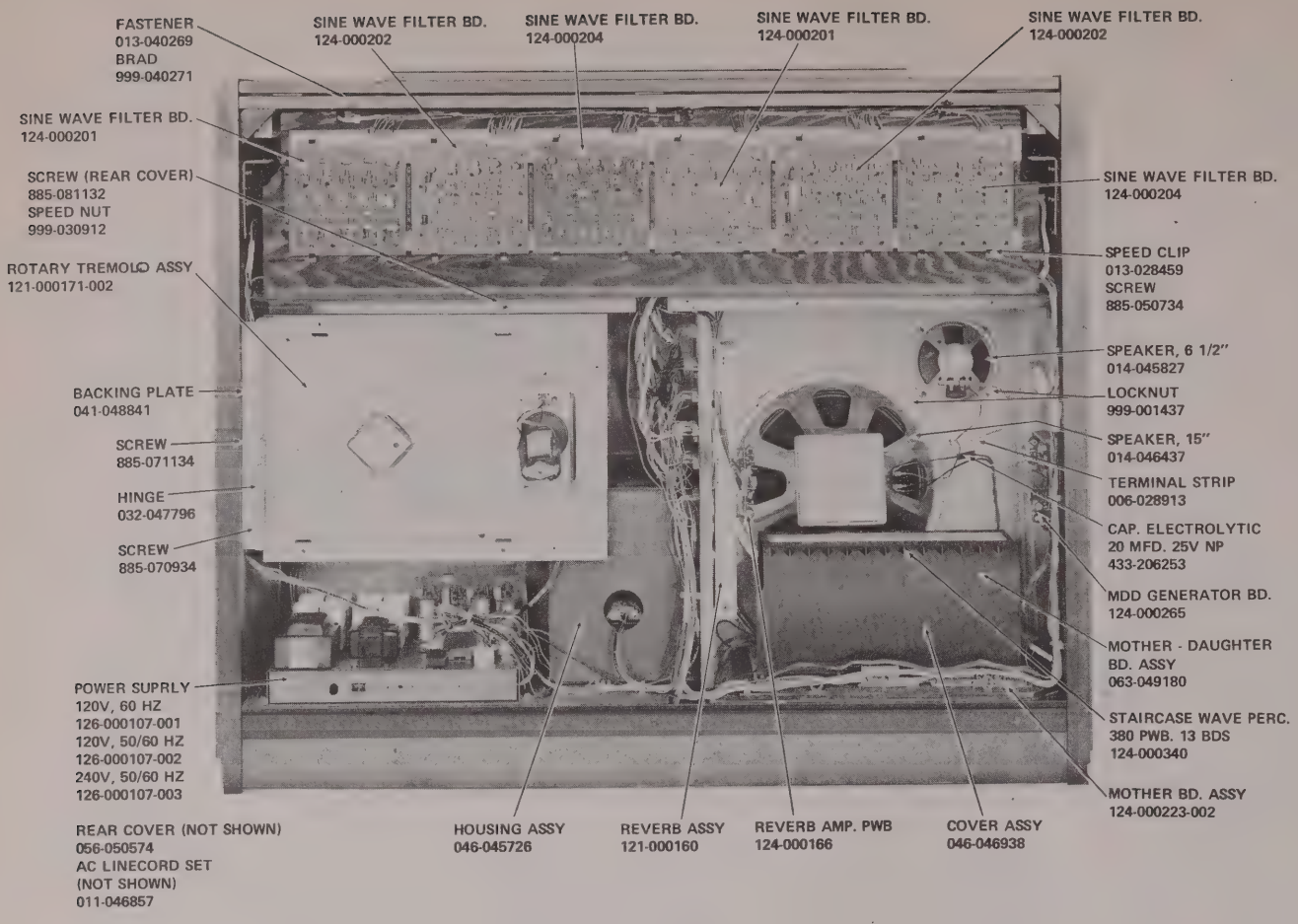
11,000 SERIES

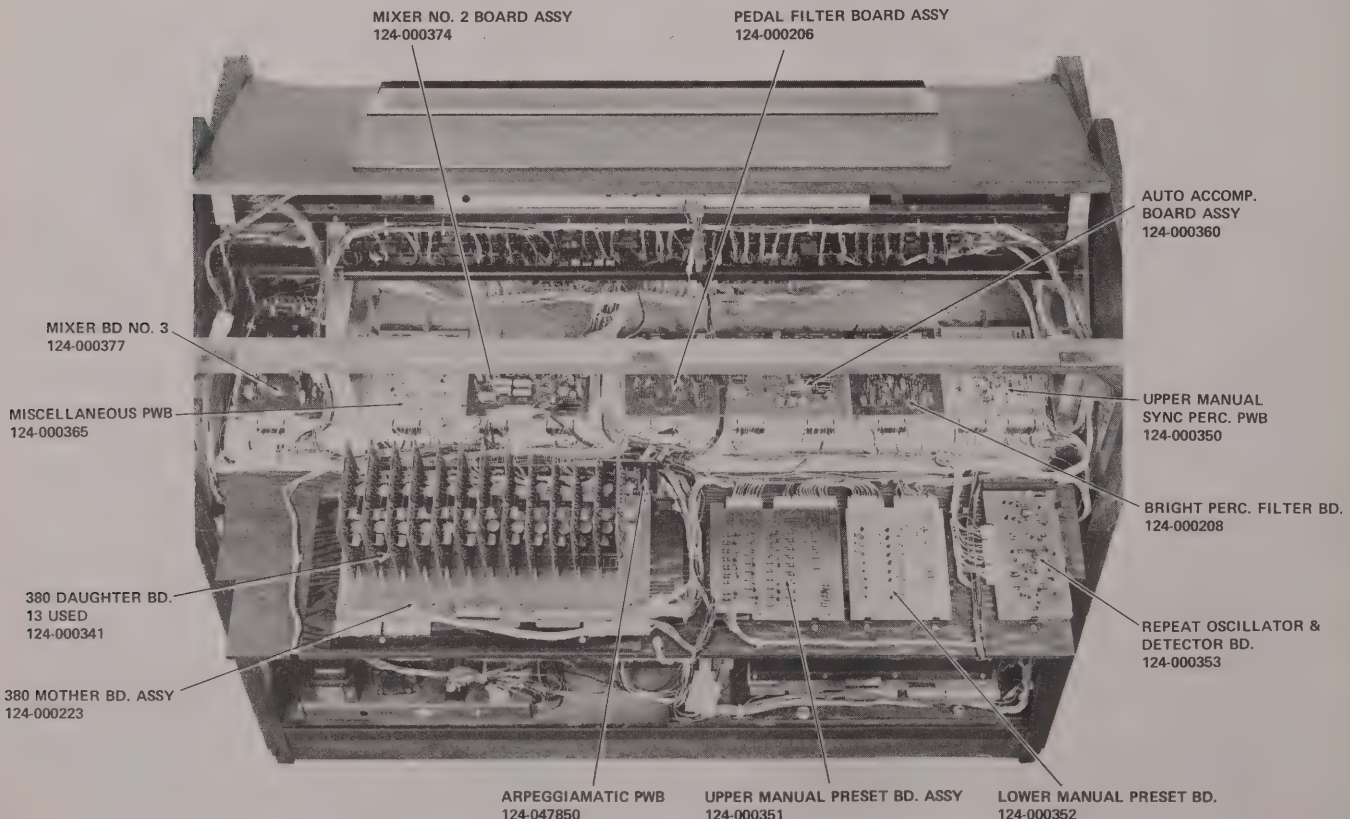
TAB NAME	TAB ONLY	SWITCH ASSEMBLY
REPEAT	031-045267-063	008-045762
PERCUSSION FAST	031-045267-180	008-045267
2	031-045267-005	008-045766
3	031-045267-006	008-045774
5	031-045267-008	008-045774
GLOCK	031-045267-182	008-045772
TWIN MALLET XYLOPHONE	031-045267-183	008-045766
TWIN MALLET MARIMBA	031-045267-184	008-045766
SECOND VOICE	031-045267-185	008-045762
PIZZICATO 1	031-045267-195	008-045766
PIZZICATO 2	031-045267-196	008-045766
BANJO	031-045267-197	008-045774
HARPSICHORD	031-045267-198	008-045774
PIANO	031-045267-199	008-045774
PIANO SOLO	031-045267-019	008-045770
SUSTAIN UPPER SHORT	031-045267-186	008-045774
SUSTAIN UPPER LONG	031-045267-187	008-045774
SUSTAIN TO FOOT SWITCH	031-045267-067	008-045773
PEDAL SUSTAIN 1	031-045267-047	008-045773
PEDAL SUSTAIN 2	031-045267-048	008-045773
LOWER TO PEDAL	031-045267-023	008-045773
ACOUSTIC TREMOLO ON UPPER	031-045267-188	008-045764
ACOUSTIC TREMOLO ON LOWER	031-045267-189	008-045764
ACOUSTIC TREMOLO CHORUS	031-045267-089	008-045772
ACOUSTIC TREMOLO CELESTE	031-045267-088	008-045771
VIBRATO 1	031-045267-060	008-045773
VIBRATO 2	031-045267-061	008-045771
DELAY VIBRATO	031-045267-062	008-045772
REVERB 1	031-045267-082	008-045774
REVERB 2	031-045267-083	008-045765
ACOUSTIC TREMOLO ON REVERB	031-452677-090	008-045765
BRILLIANCE	031-045267-085	008-045767
VOLUME SOFT	031-045267-190	008-045772

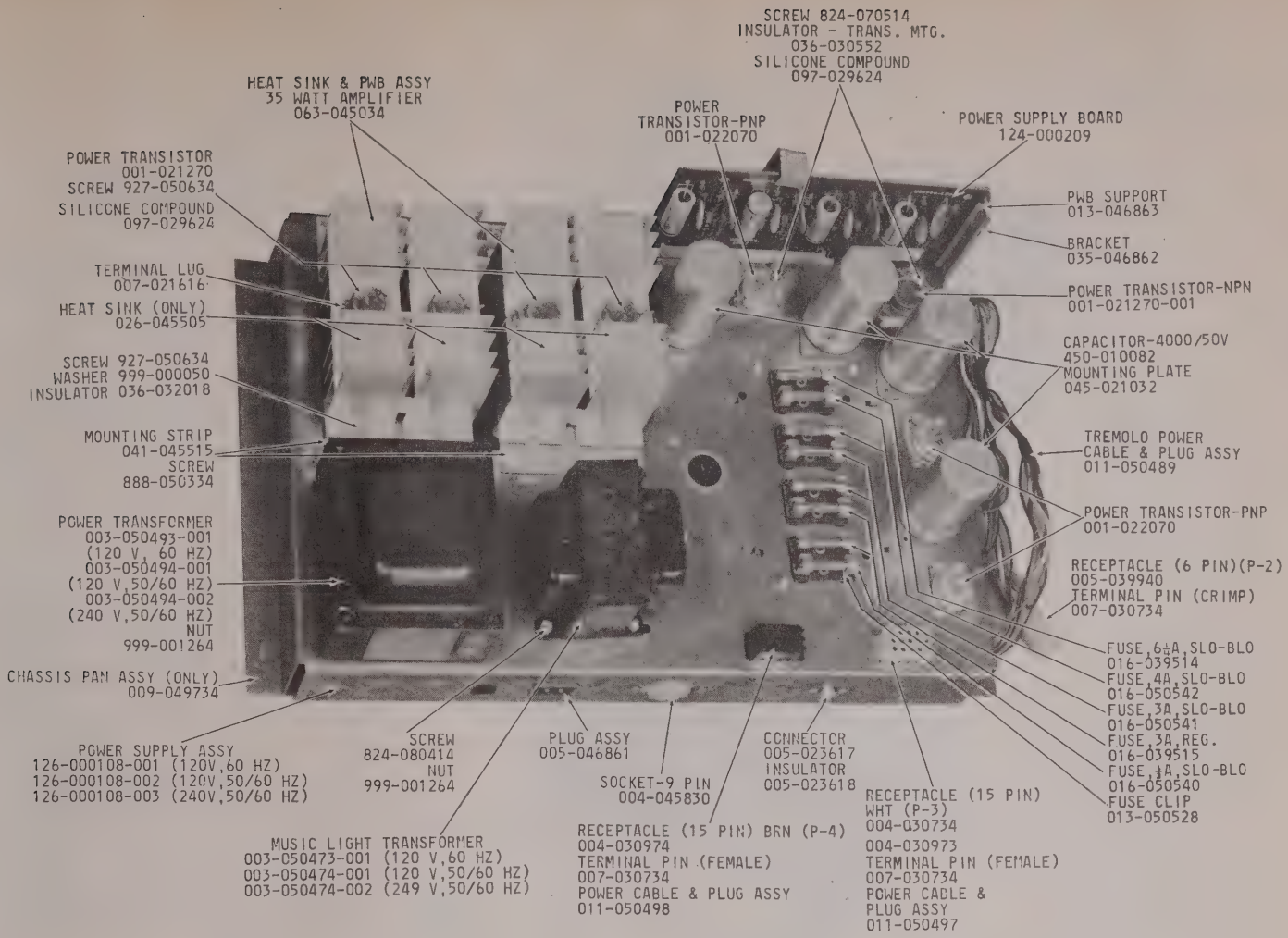

PWB ASSY NO. 3
023-045696-002
PWB ASSY NO. 2
023-045695-003
PWB ASSY NO. 1
023-045694-003
FELT - UPSTOP & DOWNSTOP
042-045678
CONNECTOR (21 PIN)
005-043366
TERMINAL PINS
007-043171
CONNECTOR (24 PIN)
005-043362
TERMINAL PINS
007-043171
PLUG (15 PIN)
005-031837
PIN, MALE
007-030735
CONNECTOR (24 PIN)
005-043362
TERMINAL PINS
007-043171
SCREW (7 USED)
927-060514
GROMMET
043-039557
SPEED NUT
999-046048
CABLE CLAMP
013-031733
SCREW
999-047801
BRACKET, UPPER MANUAL
035-046047
SCREW
927-060514
SPEED NUT
999-046048
PHONE JACK & TERMINAL STRIP ASSY
008-050402
PHONE JACK
005-049363
TERMINAL STRIP
006-030895
RESISTOR 820 OHM
600-020471
RESISTOR 1500 OHM
600-020531
RESISTOR 2200 OHM
600-020571
RESISTOR 10K OHM
600-020731
RESISTOR 15K OHM
600-020771
CAPACITOR 220 MFD/25V
433-207253
CAPACITOR, MYLAR, 22MFD/50V
405-040212
HINGE
032-046418
UPPER MANUAL SYNC. PERC. PWB
124-000350
BRIGHT PERC. FILTER PWB
124-000208
CASSETTE TERMINAL STRIP ASSY
063-051095
TERMINAL STRIP
006-030224
DIODE, ZENER, 6V
001-023043
RESISTOR 100 OHM
600-020251
RESISTOR 33 OHM 5W METALLIC FILM
626-060051
AUTO-ACCOMPANIMENT PWB
124-000360
PEDAL FILTER PWB
124-000206
MIXER NO. 2
124-000374
SPEED CLIP
013-028459
SCREW
885-050734
MISCELLANEOUS PWB
124-000365
MIXER NO. 3 PWB
124-000377

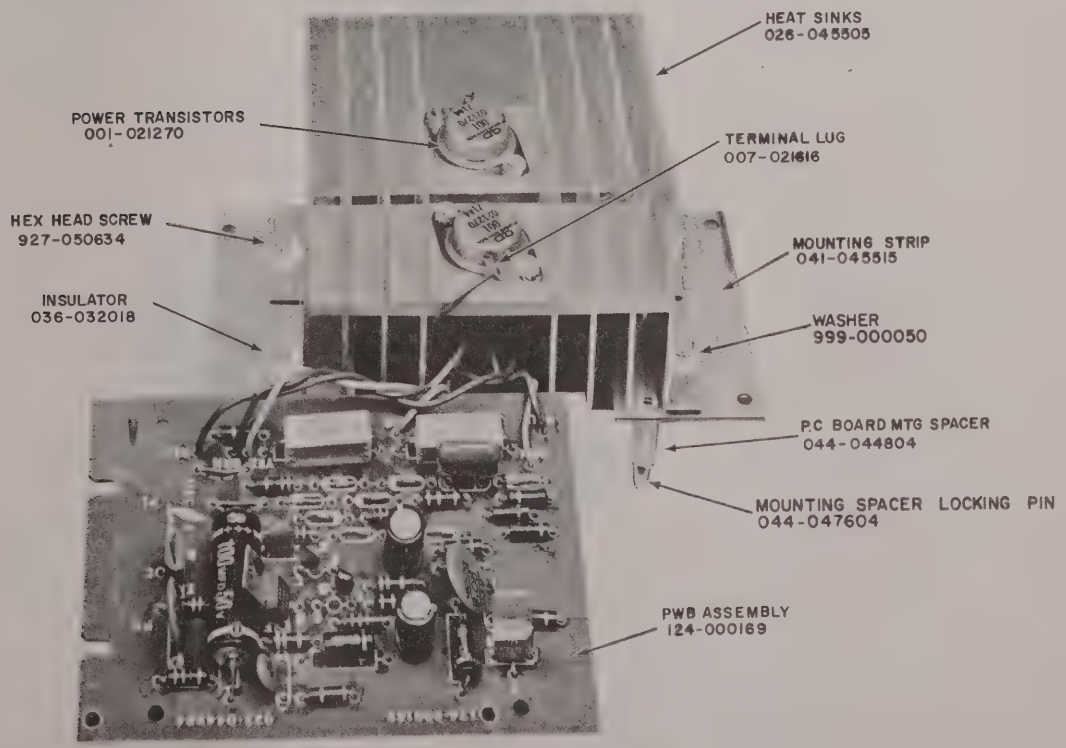

KNOB, PUSHBUTTON, VARIATION (LIGHTED)
025-050948
LENS (A) 025-050951-000
LENS (B) 025-050951-001
LENS (C) 025-050951-002
LENS (D) 025-050951-003
LAMP (4 USED)
016-050949 OR GE28E-SB & 24E-SB
ESCUTCHEON 025-050665
SCREW 884-030734
SLIDE SWITCH
008-050615
SPACER
044-050676
SCREW
884-050734
TOGGLE CAP (GOLD)
025-050616-001
ROTARY SWITCH
008-050637
LOCKWASHER
999-000846
HEX NUT
999-001206
KNOB
031-046282-002
POTENTIOMETER
676-000284
LOCKWASHER
999-000846
HEX NUT
999-001206
KNOB, TEMPO
031-046282
ROCKER TAB & SW. ASSY
SILENT/SOUND
008-050627
ESCUTCHEON
025-050629
SCREW
884-030734
KNOB, PUSHBUTTON
025-050933-001
025-045482 IVORY
BLUE
025-050933-000 MAGENTA
SWITCH, MUSIC LAMP
008-044345
SLIDE SWITCH
008-050615
SPACER
044-050676
SCREW
884-050734
TOGGLE CAP (YEL.)
025-050616-000
POTENTIOMETER
676-000270
LOCKWASHER
999-000846
HEX NUT
999-001206
KNOB (VOLUME)
031-046282-002
VOICING PWB
124-000380
CABLE CLAMP
013-031725
P2 - STRAIGHT ON CONNECTOR 15 CKT
005-043372
TERMINAL PIN
007-043171
VARIATIONS PWB
124-000418
P3 - STRAIGHT ON CONNECTOR
24 CKT
005-043361
TERMINAL PIN
007-043171
J5 - RECEPTACLE 15 CKT
004-030973
TERMINAL PIN (FEMALE)
007-030734
PLUG (15 PIN)
005-031837
PIN (MALE)
007-030735
P1 - STRAIGHT ON CONNECTOR 22 CKT
005-043364
TERMINAL PIN
007-043171
PATTERN GEN. PWB
124-000379
P4 - STRAIGHT ON CONNECTOR 24 CKT
005-043362
TERMINAL PIN
007-043171

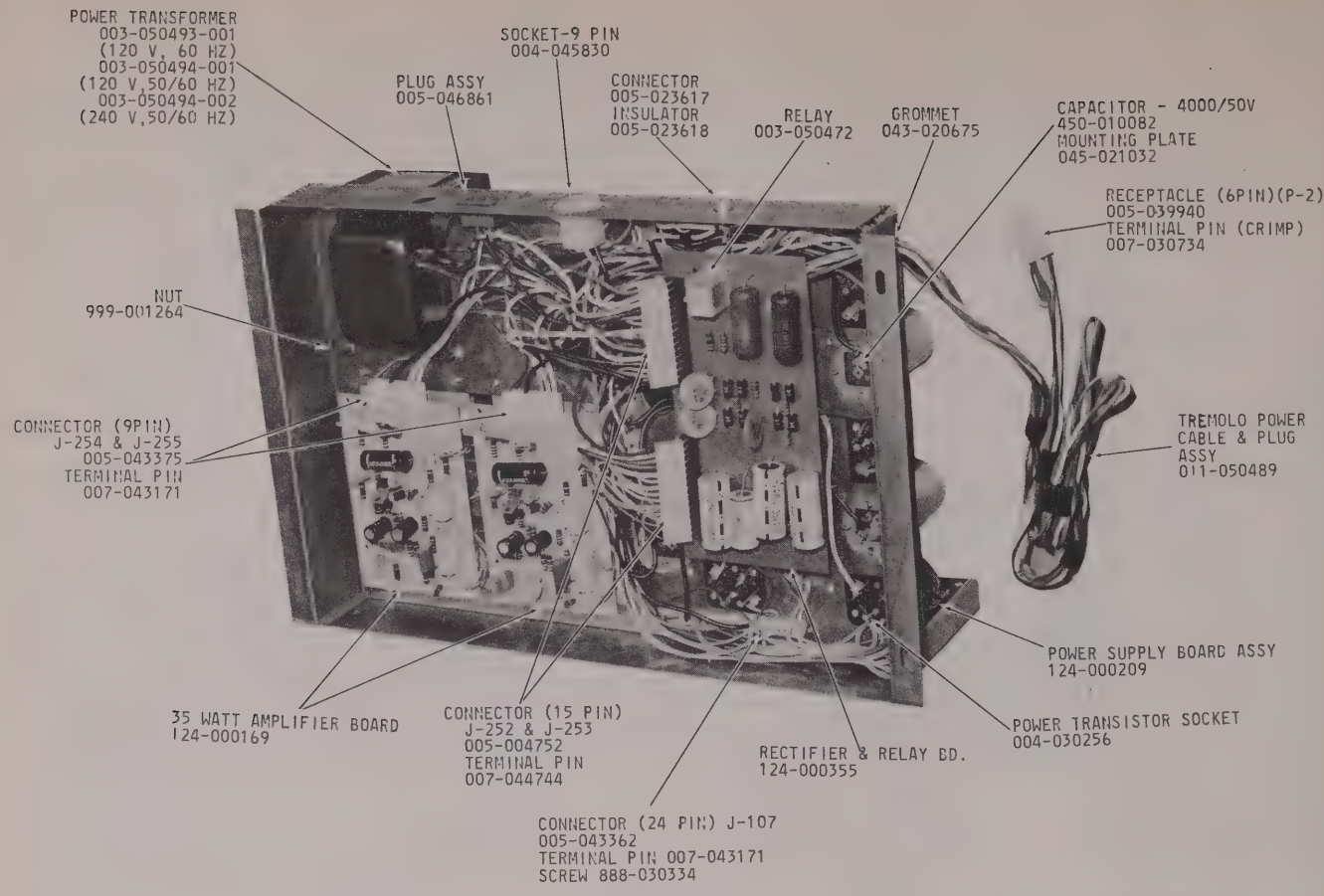
AUTOVARI – 64

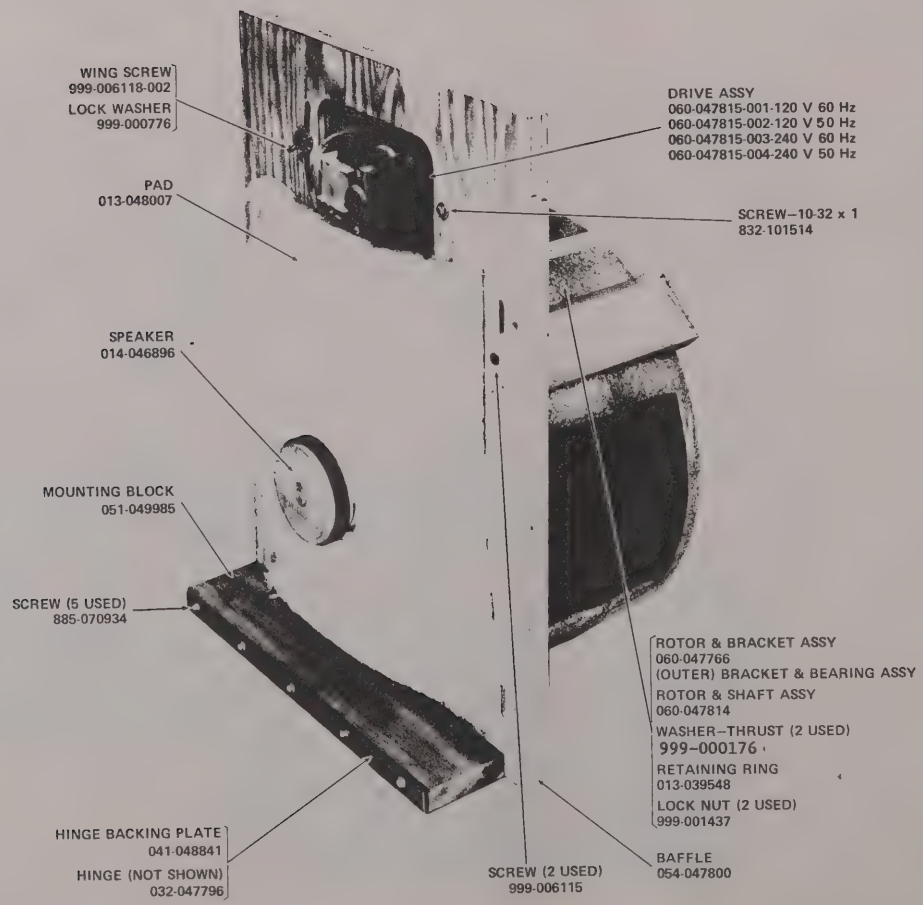

FASTENER
013-040269
BRAD
999-040271
SINE WAVE FILTER BD.
124-000202
SINE WAVE FILTER BD.
124-000204
SINE WAVE FILTER BD.
124-000201
SINE WAVE FILTER BD.
124-000202
SINE WAVE FILTER BD.
124-000201
SCREW (REAR COVER)
885-081132
SPEED NUT
999-030912
ROTARY TREMOLO ASSY
121-000171-002
BACKING PLATE
041-048841
SCREW
885-071134
HINGE
032-047796
SCREW
885-070934
POWER SUPRLY
120V, 60 HZ
126-000107-001
120V, 50/60 HZ
126-000107-002
240V, 50/60 HZ
126-000107-003
REAR COVER (NOT SHOWN)
056-050574
AC LINECORD SET
(NOT SHOWN)
011-046857
SINE WAVE FILTER BD.
124-000204
SPEED CLIP
013-028459
SCREW
885-050734
SPEAKER, 6 1/2"
014-045827
LOCKNUT
999-001437
SPEAKER, 15"
014-046437
TERMINAL STRIP
006-028913
CAP. ELECTROLYTIC
20 MFD. 25V NP
433-206253
MDD GENERATOR BD.
124-000265
MOTHER - DAUGHTER
BD. ASSY
063-049180
STAIRCASE WAVE PERC.
380 PWB. 13 BDS
124-000340
MOTHER BD. ASSY
124-000223-002
HOUSING ASSY
046-045726
REVERB ASSY
121-000160
REVERB AMP. PWB
124-000166
COVER ASSY
046-046938


MIXER NO. 2 BOARD ASSY
124-000374
PEDAL FILTER BOARD ASSY
124-000206
AUTO ACCOMP.
BOARD ASSY
124-000360
MIXER BD NO. 3
124-000377
MISCELLANEOUS PWB
124-000365
UPPER MANUAL
SYNC PERC. PWB
124-000350
BRIGHT PERC. FILTER BD.
124-000208
380 DAUGHTER BD.
13 USED
124-000341
380 MOTHER BD. ASSY
124-000223
REPEAT OSCILLATOR &
DETECTOR BD.
124-000353
ARPEGGIAMATIC PWB
124-047850
UPPER MANUAL PRESET BD. ASSY
124-000351
LOWER MANUAL PRESET BD.
124-000352

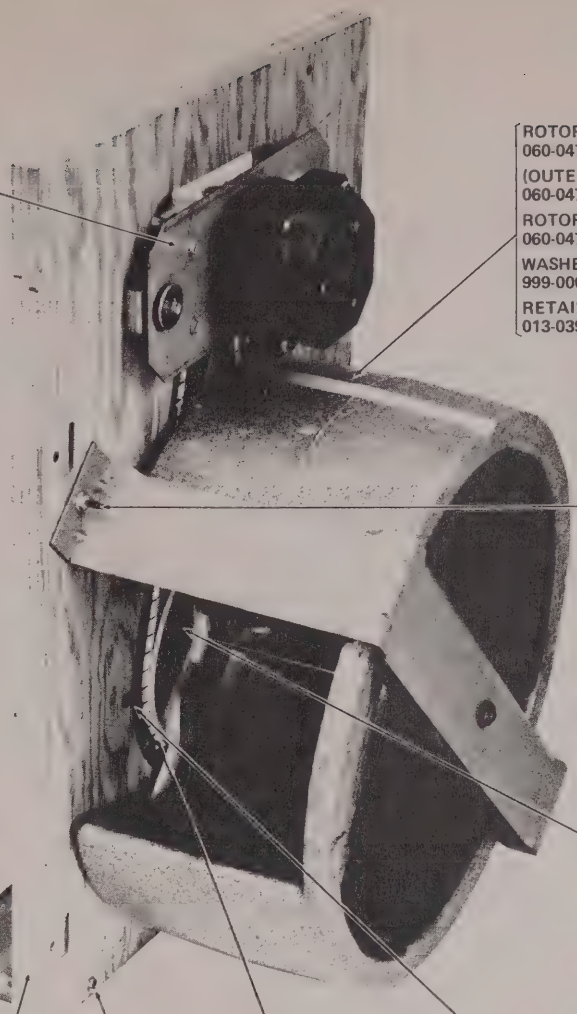

SCREW 824-070514
INSULATOR - TRANS. MTG.
036-030552
SILICONE COMPOUND
097-029624
HEAT SINK & PWB ASSY
35 WATT AMPLIFIER
063-045034
POWER
TRANSISTOR-PNP
001-022070
POWER SUPPLY BOARD
124-000209
POWER TRANSISTOR
001-021270
SCREW 927-050634
SILICONE COMPOUND
097-029624
PWB SUPPORT
013-046863
BRACKET
035-046862
TERMINAL LUG
007-021616
HEAT SINK (ONLY)
026-045505
POWER TRANSISTOR-NPN
001-021270-001
CAPACITOR-4000/50V
450-010082
MOUNTING PLATE
045-021032
SCREW 927-050634
WASHER 999-000050
INSULATOR 036-032018
MOUNTING STRIP
041-045515
SCREW
888-050334
TREMOLO POWER
CABLE & PLUG ASSY
011-050489
POWER TRANSISTOR-PNP
001-022070
POWER TRANSFORMER
003-050493-001
(120 V, 60 HZ)
003-050494-001
(120 V,50/60 HZ)
003-050494-002
(240 V,50/60 HZ)
NUT
999-001264
RECEPTACLE (6 PIN)(P-2)
005-039940
TERMINAL PIN (CRIMP)
007-030734
FUSE,6¼A,SLO-BLO
016-039514
FUSE,4A,SLO-BLO
016-050542
FUSE,3A,SLO-BLO
016-050541
FUSE,3A,REG.
016-039515
FUSE,¼A,SLO-BLO
016-050540
FUSE CLIP
013-050528
CHASSIS PAN ASSY (ONLY)
009-049734
POWER SUPPLY ASSY
126-000108-001 (120V,60 HZ)
126-000108-002 (120V,50/60 HZ)
126-000108-003 (240V,50/60 HZ)
SCREW
824-080414
NUT
999-001264
PLUG ASSY
005-046861
SOCKET-9 PIN
004-045830
CONNECTOR
005-023617
INSULATOR
005-023618
RECEPTACLE (15 PIN)
WHT (P-3)
004-030734
004-030973
TERMINAL PIN (FEMALE)
007-030734
POWER CABLE &
PLUG ASSY
011-050497
MUSIC LIGHT TRANSFORMER
003-050473-001 (120 V,60 HZ)
003-050474-001 (120 V,50/60 HZ)
003-050474-002 (249 V,50/60 HZ)
RECEPTACLE (15 PIN) BRN (P-4)
004-030974
TERMINAL PIN (FEMALE)
007-030734
POWER CABLE & PLUG ASSY
011-050498


HEAT SINKS
026-045505
POWER TRANSISTORS
001-021270
TERMINAL LUG
007-021616
HEX HEAD SCREW
927-050634
MOUNTING STRIP
041-045515
INSULATOR
036-032018
WASHER
999-000050
P.C BOARD MTG SPACER
044-044804
MOUNTING SPACER LOCKING PIN
044-047604
PWB ASSEMBLY
124-000169





TREMOLO ASSEMBLY-2 SPEED. REAR VIEW
121-000171-001 THRU 004 (4100 SERIES)



DRIVE ASSY
060-047815-001 (120 V 60 Hz)
060-047815-002 (120 V 50 Hz)
060-047815-003 (240 V 60 Hz)
060-047815-004 (240 V 50 Hz)

-001 THRU -004

MOTOR MTG PLATE
041-047673

WIRE & CONNECTOR ASSY
011-047809

BUSHING
017-047697

GROMMET (2 USED)
043-047806

SCREW (3 USED)
828-080314

RETAINING RING
013-049800

PULLEY
022-047672

SCREW
999-006117

O–RING
043-047704

BRACKET (SML MOTOR)
035-047703

LOCK NUT
999-001432

LOCK NUT (2 USED)
999-001432

SCREW (2 USED)
828-070314

FLANGE–WASHER (2 USED)
027-047805

BRACKET–DRIVE MTG
(2 USED)
035-047767

SCREW–10-32 x 5/8 (2 USED)
828-100914

-001 & -002 (ONLY)

MOTOR (4 POLE)
021-047818-001

MOTOR (2 POLE)
021-047817-001

-003 & -004 (ONLY)

MOTOR (4 POLE)
021-047818-002

MOTOR (2 POLE)
021-047817-003

-001 & -003 (ONLY)

PULLEY–SM
022047755-001

-002 & -004 (ONLY)

PULLEY–SM
022-047755-002

ROTOR & BRACKET ASSY
060-047766

(OUTER) BRACKET & BEARING ASSY
060-047765

ROTOR & SHAFT ASSY
060-047814

WASHER–THRUST (2 USED)
999-000176

RETAINING RING
013-039548

LOCK NUT (2 USED)
999-001437

SCREW (2 USED)
999-006115

BRACKET & BEARING ASSY
060-047751

(INNER) BRACKET
035-047752

GROMMET
043-048897

BEARING
017-047747

CLIP
013-048128

FELT STRIP
042-048896

OIL (SATURATE FELT)
015-042875

MOUNTING BLOCK
051-049985

BAFFLE
054-047800

SCREW (5 USED)
885-071834

BELT
022-047738-002

SCREW (4 USED)
999-006115

TREMOLO ASSEMBLY–2 SPEED
121-000171-001 THRU 004

SECTION IV
PARTS LIST

16,000 SERIES

INDEX

CONSOLE - (FULL FRONT VIEW) 4-17
Top Panel Assy
Hammond Logo
Console Case Assy.
Stop Switch Base Assy.
Front Strip & End Blocks
Pedal Switch Assy.
Pedal Keyboard (CLAVIER)
Expression Pedal
Bench
Banel & Grille Cloth Assy.
Upper & Lower Keyboard
Control Panel Assy.
Auto Vari-28 Rhythm Unit

CONSOLE UPPER FRONT VIEW 4-17
Push Buttons & Knobs
Light Emitting Diode Assy.
Rate Potentiometer
Piston Switch Assy.s
Tone Bar Assys.
Upper & Lower Manual
Rhythm Panel
Control Panel

PEDAL KEYBOARD ASSEMBLY (TOP VIEW) 4-3
Black Peday Assy.
White Pedal Assy.
Moulding
Pivot Rod
Hinge Spring

PEDAL KEYBOARD (BOTTOM VIEW) 4-4
Up & Down Felts
Pusher Springs
Stretcher
Guide & Felt Foot

KEY & SPRING ASSEMBLY 4-4
Actuator
Clamp Strip & Screws

PEDAL SWITCH ASSY. (EXPOSED) 4-5
Switch Guides
Spring Returns
Actuators
Spring Contact

TONE BAR ASSEMBLY (PEDAL) 4-7
Printed Network
Stop Channel
Contact Spring

TONE BAR ASSY. (UPPER & LOWER MANUAL) 4-7
Printed Network
Stop Channel
Contact Spring

FRONT VIEW (UPPER MANUAL UP) 4-18
Auto Vari - 28 Board (124-000430)
Potentiometers & Switches
Control Panel
U/M Syn. Perc. Board (124-000350)
Bright Perc. Board (124-000208)
Auto Accomp. Board (124-000424)
Pedal Filter Board (124-000206)
Mixer Board #2 (124-000376)
Mixer Board #3 (124-000377)
Manual PWB's
Pedal Term. Strip
Phone Jack Term. Strip
Chain Assy.
Housing Indicator Lamp Assy.

TAB & SWITCH ASSY. 4-18
Tab (Only)
Switch (Only)
See Page 4-8 for Common Parts

CONSOLE (FULL REAR VIEW) 4-19
Sine Filter Bd. #2 (124-000202)
Sine Filter Bd. #1 (124-000201)
Sine Filter Bd. #3 (124-000204)
U/M Syn. Bd. (124-000223-002)
Staircase Wave. Perc. Bd. (124-000340)
MDD Generator Bd. (124-000265)
Reverb & Bd. Assy. (124-000166)
Power amplifier
Housing Assy.
Tremolo Assy.
Rear Cover (Back)
Panel Lock & Bracket Assy.

REAR (UPPER VIEW) 4-19
Repeat Osc. & Det. Board (124-000353)
Lower Manual Preset Bd. (124-000352)
Lower Manual Syn. Mother Bd. (124-000223)
Lower Manual Daughter Bd. (124-000341)
U/M Preset Board (124-000351)
Pivot Bracket Assy.
Chain Assy.

POWER AMPLIFIER ASSY. (TOP VIEW) 4-20
Heat Sinks
Power Transistor
Capacitors Board
Transformer

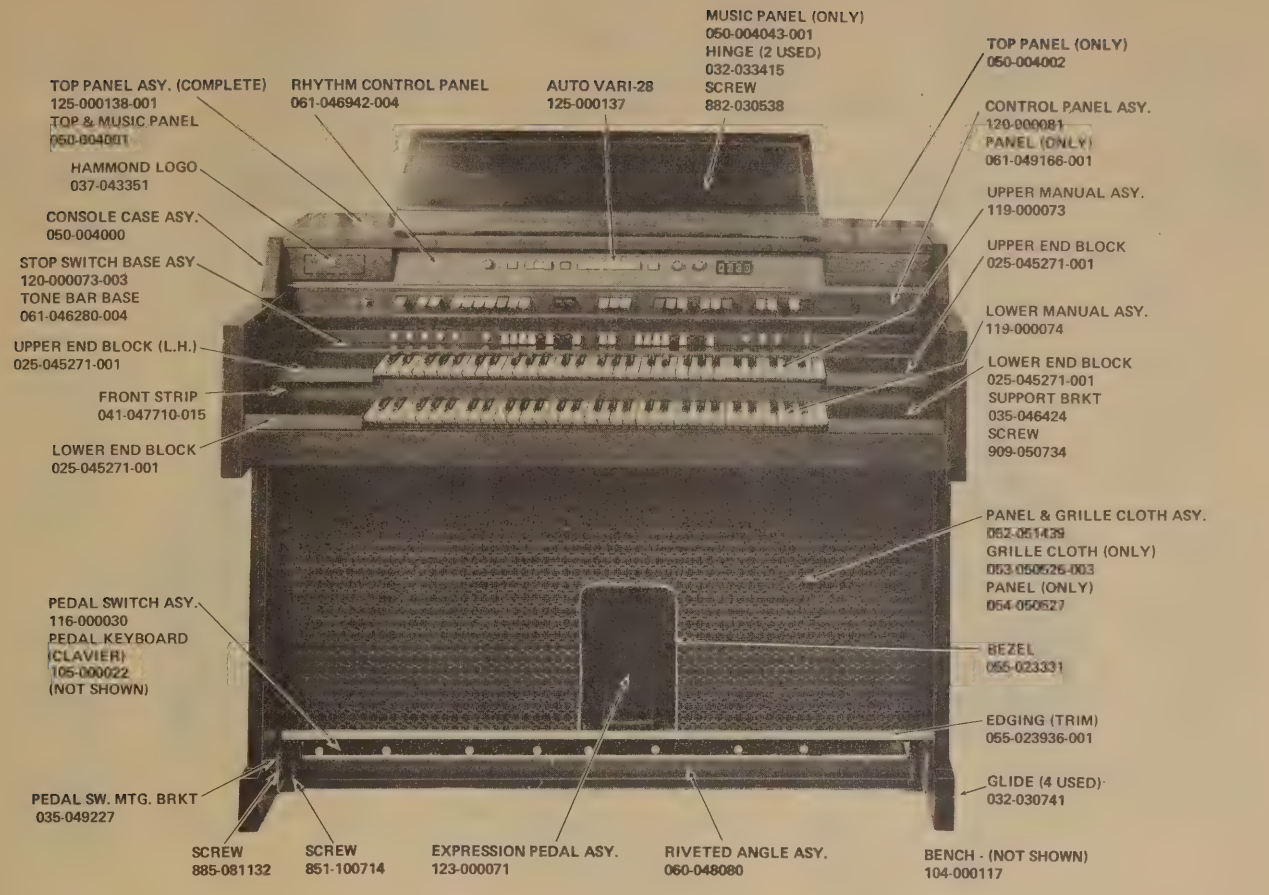
POWER AMPLIFIER ASSY (BOTTOM VIEW) 4-20
Relay
Capacitors & Resistors
Varistor, Transistors & Diodes

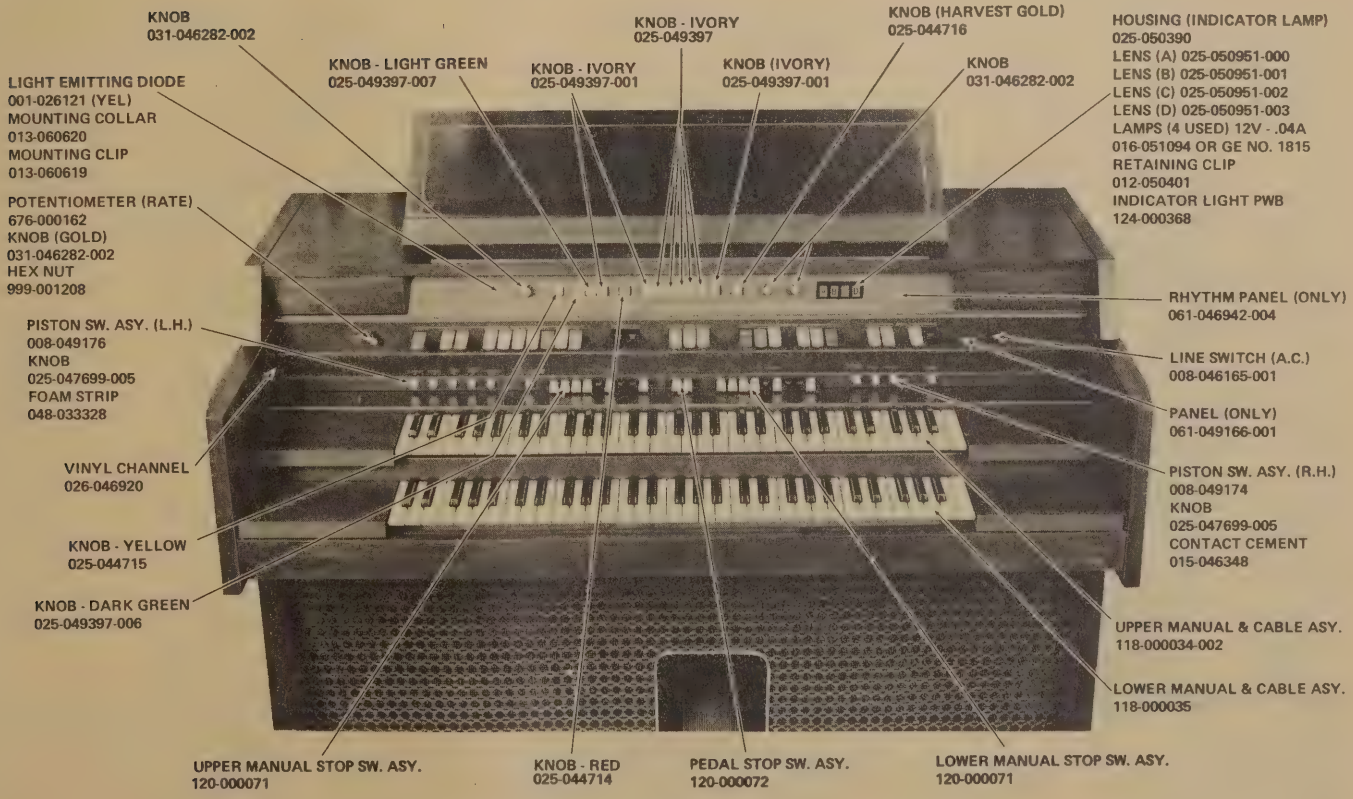
35 WATT AMP MODULE 4-11
Heat Sink
Power Transistor
35 Watt Amp Board (124-000169)

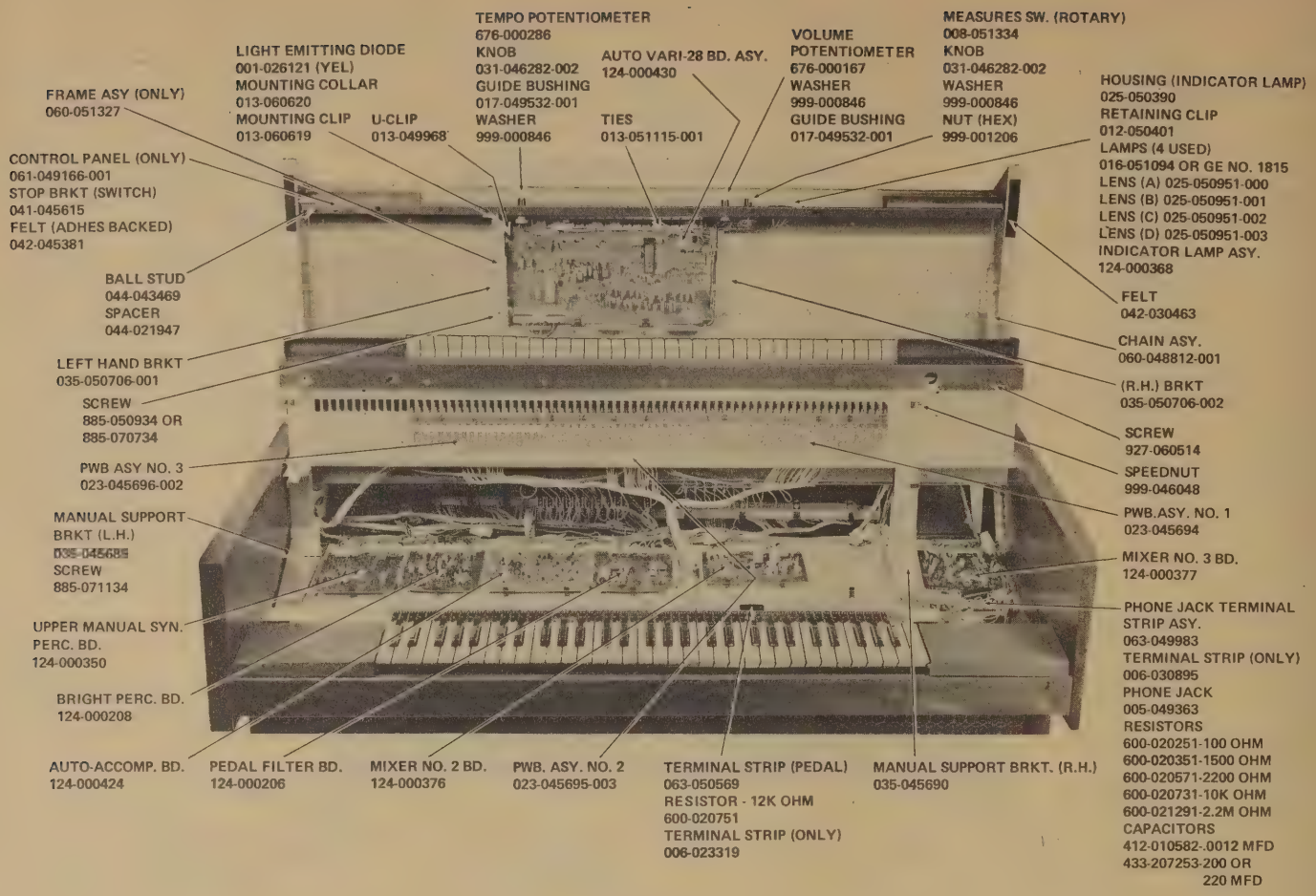
TREMOLO ASSY (REAR VIEW) 4-12
Drive Assembly
Speaker
Pad
Baffle
Rotor & Bracket Assy.

TREMOLO ASSEMBLY (FRONT VIEW) 4-12
Drive Assembly
Belt
Bracket & Bearing Assy.
Motor & Pulley

PRINTED WIRING BOARDS
Parts List 4-21


MUSIC PANEL (ONLY)
050-004043-001
HINGE (2 USED)
032-033415
SCREW
882-030538
TOP PANEL (ONLY)
050-004002
TOP PANEL ASY. (COMPLETE)
125-000138-001
TOP & MUSIC PANEL
050-004001
RHYTHM CONTROL PANEL
061-046942-004
AUTO VARI-28
125-000137
CONTROL PANEL ASY.
120-000081
PANEL (ONLY)
061-049166-001
HAMMOND LOGO
037-043351
CONSOLE CASE ASY.
050-004000
UPPER MANUAL ASY.
119-000073
STOP SWITCH BASE ASY
120-000073-003
TONE BAR BASE
061-046280-004
UPPER END BLOCK
025-045271-001
LOWER MANUAL ASY.
119-000074
UPPER END BLOCK (L.H.)
025-045271-001
LOWER END BLOCK
025-045271-001
SUPPORT BRKT
035-046424
SCREW
909-050734
FRONT STRIP
041-047710-015
LOWER END BLOCK
025-045271-001
PANEL & GRILLE CLOTH ASY.
052-051439
GRILLE CLOTH (ONLY)
053-050526-003
PANEL (ONLY)
054-050527
PEDAL SWITCH ASY.
116-000030
PEDAL KEYBOARD
(CLAVIER)
105-000022
(NOT SHOWN)
BEZEL
055-023331
EDGING (TRIM)
055-023936-001
GLIDE (4 USED)
032-030741
PEDAL SW. MTG. BRKT
035-049227
SCREW
885-081132
SCREW
851-100714
EXPRESSION PEDAL ASY.
123-000071
RIVETED ANGLE ASY.
060-048080
BENCH - (NOT SHOWN)
104-000117

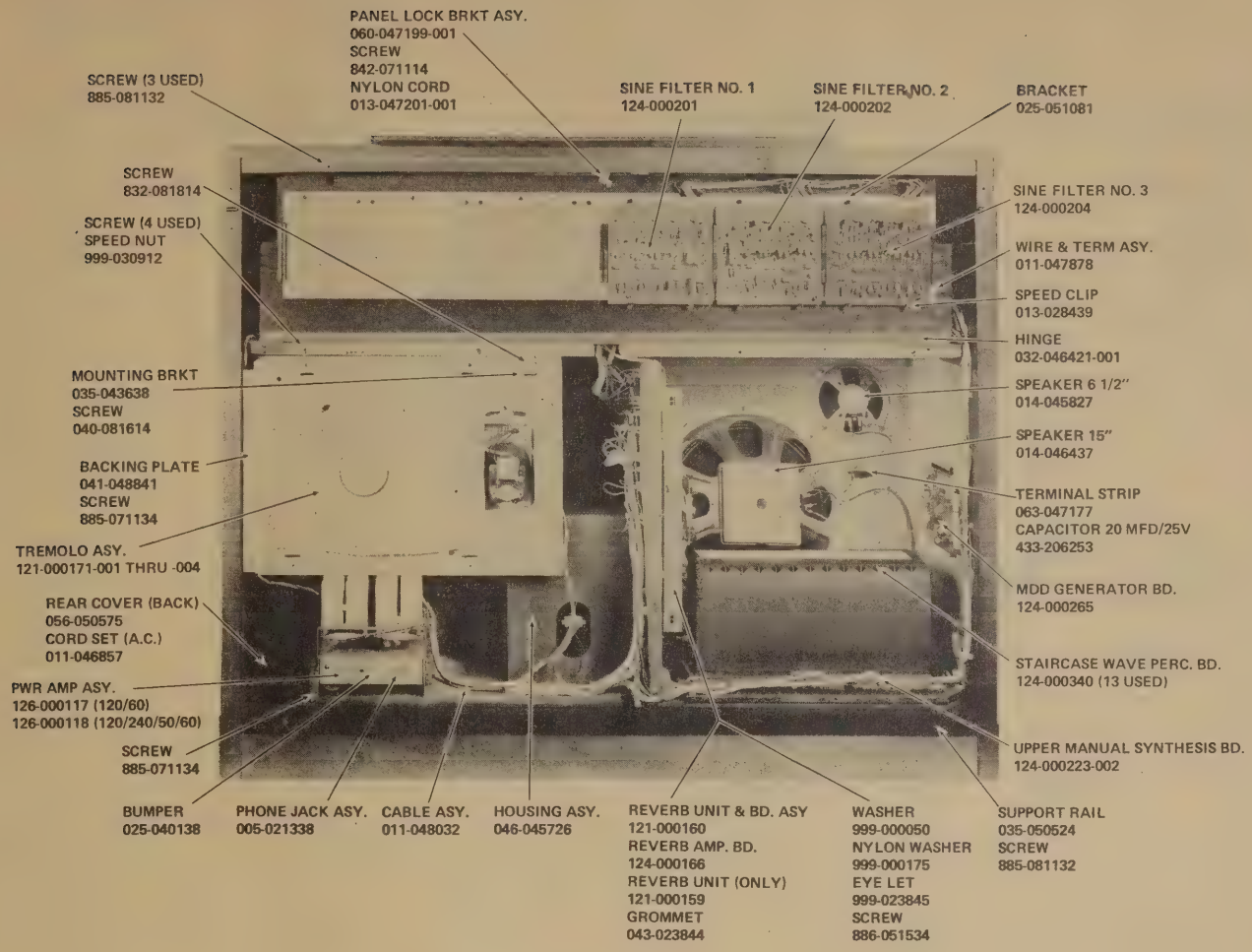

KNOB
031-046282-002
KNOB - IVORY
025-049397
KNOB (HARVEST GOLD)
025-044716
HOUSING (INDICATOR LAMP)
025-050390
LENS (A) 025-050951-000
LENS (B) 025-050951-001
LENS (C) 025-050951-002
LENS (D) 025-050951-003
LAMPS (4 USED) 12V - .04A
016-051094 OR GE NO. 1815
RETAINING CLIP
012-050401
INDICATOR LIGHT PWB
124-000368
KNOB - LIGHT GREEN
025-049397-007
KNOB - IVORY
025-049397-001
KNOB (IVORY)
025-049397-001
KNOB
031-046282-002
LIGHT EMITTING DIODE
001-026121 (YEL)
MOUNTING COLLAR
013-060620
MOUNTING CLIP
013-060619
POTENTIOMETER (RATE)
676-000162
KNOB (GOLD)
031-046282-002
HEX NUT
999-001208
RHYTHM PANEL (ONLY)
061-046942-004
PISTON SW. ASY. (L.H.)
008-049176
KNOB
025-047699-005
FOAM STRIP
048-033328
LINE SWITCH (A.C.)
008-046165-001
PANEL (ONLY)
061-049166-001
VINYL CHANNEL
026-046920
PISTON SW. ASY. (R.H.)
008-049174
KNOB
025-047699-005
CONTACT CEMENT
015-046348
KNOB - YELLOW
025-044715
KNOB - DARK GREEN
025-049397-006
UPPER MANUAL & CABLE ASY.
118-000034-002
LOWER MANUAL & CABLE ASY.
118-000035
UPPER MANUAL STOP SW. ASY.
120-000071
KNOB - RED
025-044714
PEDAL STOP SW. ASY.
120-000072
LOWER MANUAL STOP SW. ASY.
120-000071

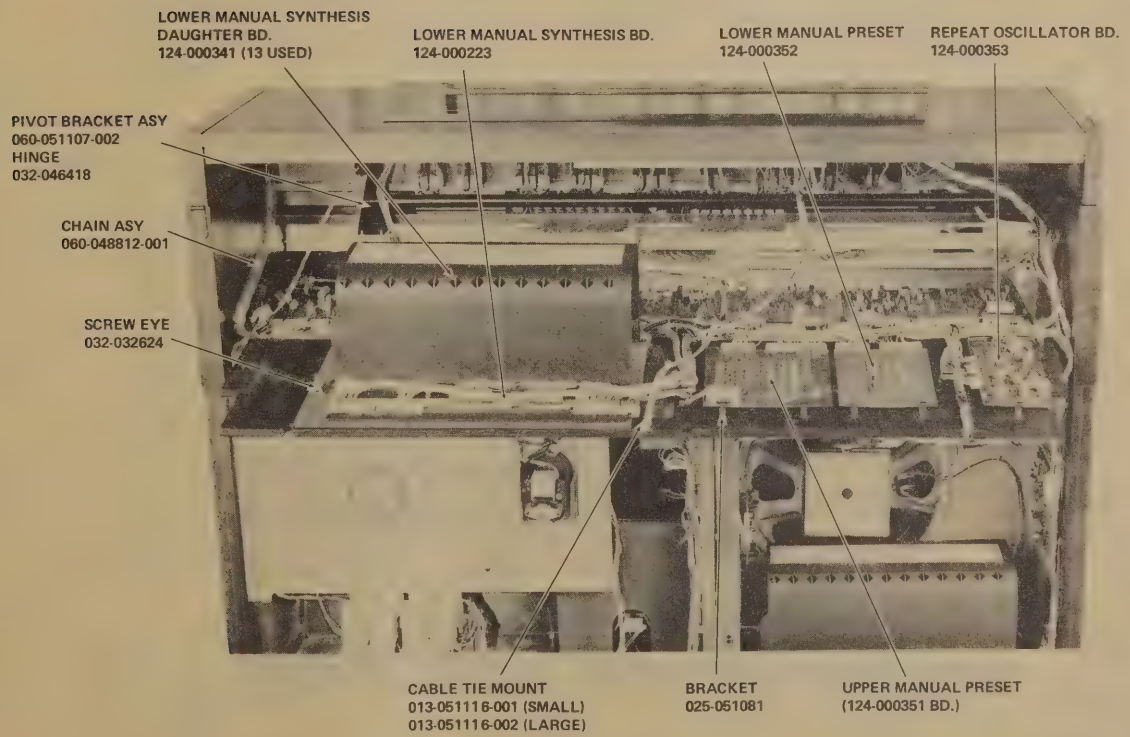


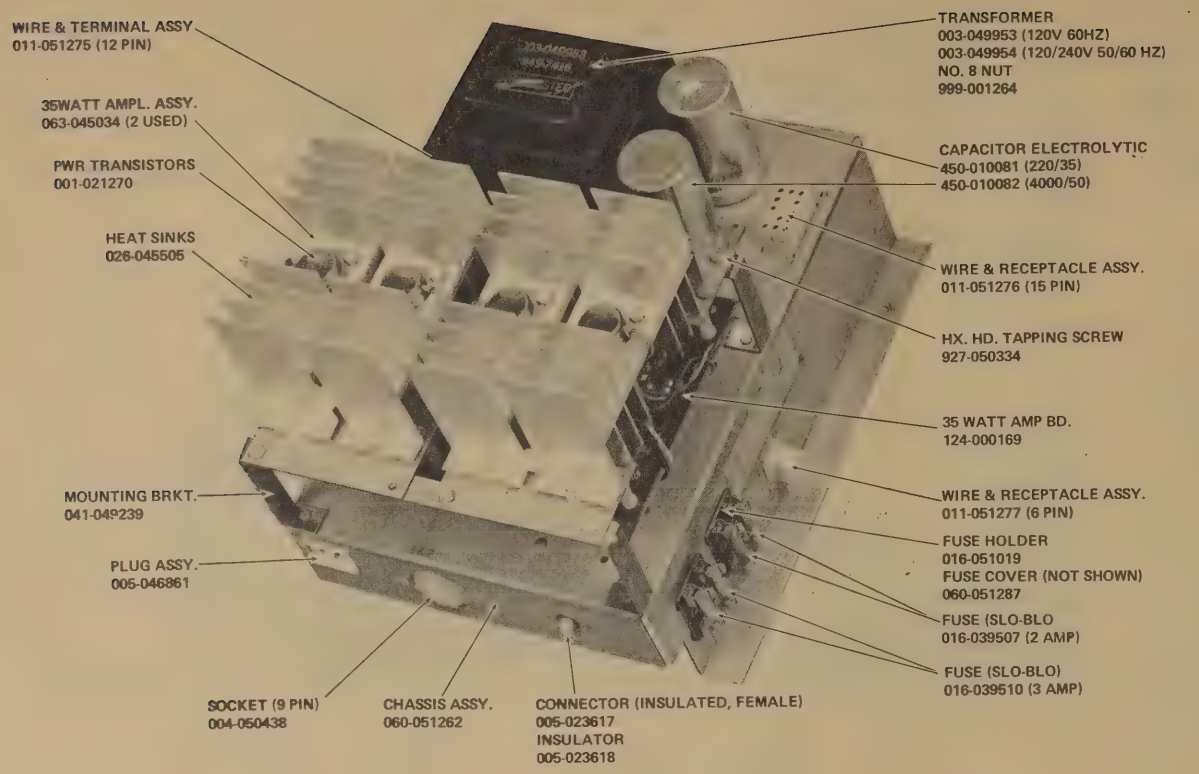
16,000 SERIES

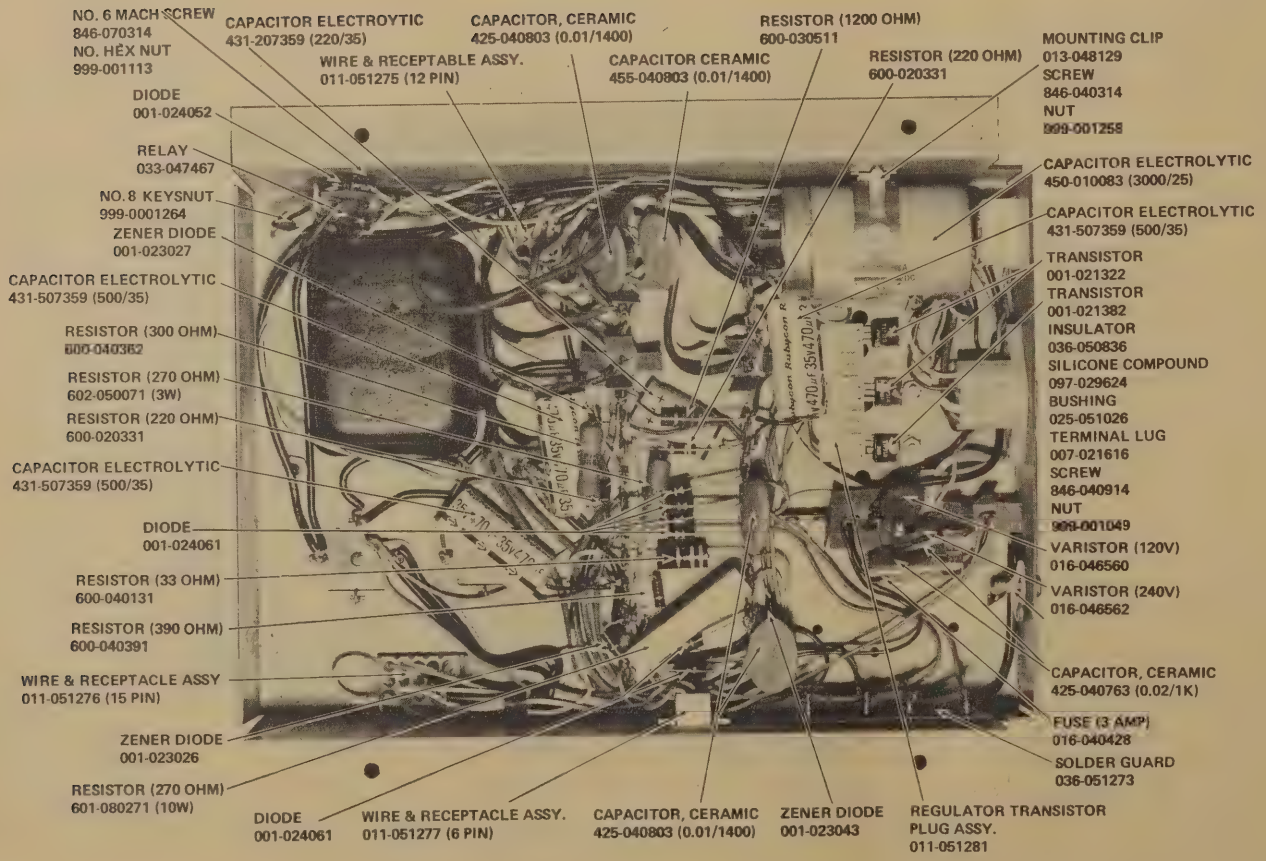
TAB NAME	TAB ONLY	SWITCH ASSEMBLY
REPEAT	031-045267-063	008-045762
2	031-045267-005	008-045772
3	031-045267-007	008-045772
SECOND VOICE	031-045267-185	008-045762
PIZZICATO 1	031-045267-195	008-045766
PIZZICATO 2	031-045267-196	008-045766
BANJO	031-045267-197	008-045774
HARPSICHORD	031-045267-198	008-045774
PIANO	031-045267-199	008-045774
PIANO SOLO	031-045267-019	008-045770
SUSTAIN UPPER SHORT	031-045267-186	008-045774
SUSTAIN UPPER LONG	031-045267-187	008-045774
PEDAL SUSTAIN 1	031-045267-047	008-045773
PEDAL SUSTAIN 2	031-045267-048	008-045773
LOWER TO PEDAL	031-045267-023	008-045773
ACOUSTIC TREMOLO ON	031-045267-091	008-045764
ACOUSTIC TREMOLO CHORUS	031-045267-089	008-045772
ACOUSTIC TREMOLO CELESTE	031-045267-088	008-045771
VIBRATO 1	031-045267-060	008-045773
VIBRATO 2	031-045267-061	008-045771
DELAY VIBRATO	031-045267-062	008-045772
REVERB 1	031-045267-082	008-045774
REVERB 2	031-045267-083	008-045765
BRILLIANCE	031-045267-085	008-045773
VOLUME SOFT	031-045267-190	008-045772

*FOR COMMON PARTS SEE ILLUSTRATION ON PAGE 4-8


PANEL LOCK BRKT ASY.
060-047199-001
SCREW
842-071114
NYLON CORD
013-047201-001
SCREW (3 USED)
885-081132
SINE FILTER NO. 1
124-000201
SINE FILTER NO. 2
124-000202
BRACKET
025-051081
SCREW
832-081814
SCREW (4 USED)
SPEED NUT
999-030912
SINE FILTER NO. 3
124-000204
WIRE & TERM ASY.
011-047878
SPEED CLIP
013-028439
HINGE
032-046421-001
MOUNTING BRKT
035-043638
SCREW
040-081614
SPEAKER 6 1/2"
014-045827
SPEAKER 15"
014-046437
BACKING PLATE
041-048841
SCREW
885-071134
TERMINAL STRIP
063-047177
CAPACITOR 20 MFD/25V
433-206253
TREMOLO ASY.
121-000171-001 THRU -004
MDD GENERATOR BD.
124-000265
REAR COVER (BACK)
056-050575
CORD SET (A.C.)
011-046857
STAIRCASE WAVE PERC. BD.
124-000340 (13 USED)
PWR AMP ASY.
126-000117 (120/60)
126-000118 (120/240/50/60)
UPPER MANUAL SYNTHESIS BD.
124-000223-002
SCREW
885-071134
BUMPER
025-040138
PHONE JACK ASY.
005-021338
CABLE ASY.
011-048032
HOUSING ASY.
046-045726
REVERB UNIT & BD. ASY
121-000160
REVERB AMP. BD.
124-000166
REVERB UNIT (ONLY)
121-000159
GROMMET
043-023844
WASHER
999-000050
NYLON WASHER
999-000175
EYE LET
999-023845
SCREW
886-051534
SUPPORT RAIL
035-050524
SCREW
885-081132


LOWER MANUAL SYNTHESIS
DAUGHTER BD.
124-000341 (13 USED)
LOWER MANUAL SYNTHESIS BD.
124-000223
LOWER MANUAL PRESET
124-000352
REPEAT OSCILLATOR BD.
124-000353
PIVOT BRACKET ASY
060-051107-002
HINGE
032-046418
CHAIN ASY
060-048812-001
SCREW EYE
032-032624
CABLE TIE MOUNT
013-051116-001 (SMALL)
013-051116-002 (LARGE)
BRACKET
025-051081
UPPER MANUAL PRESET
(124-000351 BD.)


WIRE & TERMINAL ASSY
011-051275 (12 PIN)
35WATT AMPL. ASSY.
063-045034 (2 USED)
PWR TRANSISTORS
001-021270
HEAT SINKS
026-045505
MOUNTING BRKT.
041-049239
PLUG ASSY.
005-046861
SOCKET (9 PIN)
004-050438
CHASSIS ASSY.
060-051262
CONNECTOR (INSULATED, FEMALE)
005-023617
INSULATOR
005-023618
TRANSFORMER
003-049953 (120V 60HZ)
003-049954 (120/240V 50/60 HZ)
NO. 8 NUT
999-001264
CAPACITOR ELECTROLYTIC
450-010081 (220/35)
450-010082 (4000/50)
WIRE & RECEPTACLE ASSY.
011-051276 (15 PIN)
HX. HD. TAPPING SCREW
927-050334
35 WATT AMP BD.
124-000169
WIRE & RECEPTACLE ASSY.
011-051277 (6 PIN)
FUSE HOLDER
016-051019
FUSE COVER (NOT SHOWN)
060-051287
FUSE (SLO-BLO
016-039507 (2 AMP)
FUSE (SLO-BLO)
016-039510 (3 AMP)


NO. 6 MACH SCREW
846-070314
NO. HEX NUT
999-001113
CAPACITOR ELECTROYTIC
431-207359 (220/35)
CAPACITOR, CERAMIC
425-040803 (0.01/1400)
RESISTOR (1200 OHM)
600-030511
WIRE & RECEPTABLE ASSY.
011-051275 (12 PIN)
CAPACITOR CERAMIC
455-040803 (0.01/1400)
RESISTOR (220 OHM)
600-020331
MOUNTING CLIP
013-048129
SCREW
846-040314
NUT
999-001258
DIODE
001-024052
RELAY
033-047467
NO.8 KEYSNUT
999-0001264
ZENER DIODE
001-023027
CAPACITOR ELECTROLYTIC
431-507359 (500/35)
RESISTOR (300 OHM)
600-040362
RESISTOR (270 OHM)
602-050071 (3W)
RESISTOR (220 OHM)
600-020331
CAPACITOR ELECTROLYTIC
431-507359 (500/35)
DIODE
001-024061
RESISTOR (33 OHM)
600-040131
RESISTOR (390 OHM)
600-040391
WIRE & RECEPTACLE ASSY
011-051276 (15 PIN)
ZENER DIODE
001-023026
RESISTOR (270 OHM)
601-080271 (10W)
DIODE
001-024061
WIRE & RECEPTACLE ASSY.
011-051277 (6 PIN)
CAPACITOR, CERAMIC
425-040803 (0.01/1400)
ZENER DIODE
001-023043
REGULATOR TRANSISTOR
PLUG ASSY.
011-051281
CAPACITOR ELECTROLYTIC
450-010083 (3000/25)
CAPACITOR ELECTROLYTIC
431-507359 (500/35)
TRANSISTOR
001-021322
TRANSISTOR
001-021382
INSULATOR
036-050836
SILICONE COMPOUND
097-029624
BUSHING
025-051026
TERMINAL LUG
007-021616
SCREW
846-040914
NUT
999-001049
VARISTOR (120V)
016-046560
VARISTOR (240V)
016-046562
CAPACITOR, CERAMIC
425-040763 (0.02/1K)
FUSE (3 AMP)
016-040428
SOLDER GUARD
036-051273

124-000166 REVERBERATION BOARD ASSEMBLY

PWB (NO PARTS)		023-044507
POTENTIOMETER		
R20	50K	676-000069
CAPACITORS		
ELECTROLYTIC		
C3	5/50V	407-080539
C11	5/50V	407-080549
C4	100/25V	407-060349
C6	200V	407-060849
DIODE		
D1,2		001-026080
TRANSISTOR		
Q7		001-021260
Q1		001-021070
Q5		001-021232
Q4		001-022032
Q2,3,8		001-021133

124-000169 PRINTED WIRING BOARD ASSEMBLY

PWB (NO PARTS)		023-044884
CAPACITOR		
ELECTROLYTIC		
C1,3	5/50V	407-080549
C4,7	50/25V	407-060649
C6	100/50V	407-080669
DIODE		
D1		
THRU		
D8		001-026080
TRANSISTOR		
Q1,2	NPN	001-021100
Q3	PNP	001-022040
Q4	PNP	001-022050
Q5	NPN	001-021240

124-000201 PRINTED WIRING BOARD ASSY. #1

PWB (NO PARTS)		023-045845
TRANSISTOR		
Q1,3,5,7,9	NPN	001-021260
Q2,4,6,8,10	NPN	001-021135

124-000202 PRINTED WIRING BOARD ASSY #2

CAPACITOR		
ELECTROLYTIC		
C48	5mf/50V	431-056059
C51	10mf/50v	431-106509
C52	500mf/35V	431-507359
C23, 24	50mf/25V	432-506259
C1,12	100mf/15V	432-107159
TRANSISTOR		
Q3,6,9,12	NPN	001-021135
Q13,14	NPN	001-021260
Q1,4,7,10	PNP	001-021172
Q2,5,8,11	NPN	001-021260

124-000204 PRINTED WIRING BOARD ASSY.

PWB (NO PARTS)		023-045855
TRANSISTOR		
Q1,4,7,10,13	PNP	001-021172
Q2,5,8,11	NPN	001-021260
Q3,6,9,12,14	NPN	001-021135
CAPACITOR		
ELECTROLYTIC		
C23,34,45	50mfd/25V	432-506259
C1,12	100mfd/15V	432-107159

124-000206 PEDAL FILTER BOARD

PWB(NO PARTS)		023-046056
CAPACITOR		
ELECTROLYTIC		
C1,10,23,26,30	5/50V	431-056509
C27	500/35	431-507359
TRANSISTOR		
Q5,6		001-021070
Q7,8		001-021133
Q1,2,3,4,9		001-021135
Q10		001-021260
DIODE		
D1		001-026080
POTENTIOMETER		
R34	100K Ohms	676-000073

124-000208 BRIGHT PERCUSSION FILTER

CAPACITOR		
Electrolytic		
C10	100/25V	407-060349
C12,32	5/50V	407-080549
TRANSISTOR		
Q5, 1		001-021070
Q7,8		001-021260
Q3		001-021260
Q11		001-021132
Q9,10		001-021133
Q4,12		001-021135
Q2,6		001-021172
POTENTIOMETER		
TRIMMER	100K	
R17,7,44,69	1/8W	676-000073
R28	250K	
	1/8W	676-000077

124-000209 POWER SUPPLY BOARD

PWB (NO PARTS)		023-046408
POTENTIOMETER		
R7,17,27,37	1K	676-000057
CAPACITOR		
C8,12,17,21	100mf/50V	407-080669
DIODE		
D17		001-023030
D8		001-023031
D16		001-023035
D7		001-026080
D6		001-022038
TRANSISTOR		
Q3	NPN	001-021133
Q2		001-021260
Q12,13,23,32,33	PNP	001-021172

124-000223 LOWER MANUAL SYN. MOTHER BD.

POTENTIOMETER		
R8	220 OHM	676-000053
DIODE		
D1		001-026080
TRANSISTOR		
Q1		001-022020

124-000223-002 U/M SYNTH. MOTHER BD.

PWB (NO PARTS)		023-046466
PRINTED WIRING BOARD		023-046466
Connector		005-046279
Wafer Assy. (15 Pin)		005-044534
Wafer Assy. (12 Pin)		005-044533
Wafer Assy. (10 Pin)		005-044536
Potentiometer	220 OHMs	676-000053

124-000265 MDD GENERATOR

POTENTIOMETER		
R20	1000 OHMS	676-000057
R6	50K	676-000069
R10	250K	676-000077
CAPACITOR		
Electrolytic		
C8,9	5/50V	407-080549
C6,7	50/25V	407-060679
C20	100/25V	407-060349
TANTALUM		
C2	4.7/25V	414-040132
TRANSISTOR		
Q4,6,7,9		001-021133
Q2,3		001-021135
Q1		001-021170
Q5		001-021100
DIODE		
D1,2,4,7 THRU 24		001-026080
D3 VARICAP		001-026090
DIODE		
Zener		
D5	16V	001-223038
D1	5V	001-223030
COIL		
L1	10-2 uh	003-46269

124-000265 MDD GENERATOR CONTINUED

Integrated Circuit	IC1	075-046270
Integrated Circuit	IC2	075-047242
Integrated Circuit	IC3	075-047243

124-000340 STAIRCASE WAVE PERC. BOARD

PWB (NO PARTS)		023-049605
Integrated Circuit	IC1	075-000380
DIODES		
D1-D35		001-226080
CAPACITOR		
Electrolytic	.05mfd/100V	427-170095

124-000341 LOWER MANUAL SYNTHESIS BOARD

PWB (NO PARTS)		023-045545
Integrated Circuit	IC1	075-000380
DIODES		
D1,D14, D20,D25		001-226080
CAPACITORS		
	.01 mfd	412-110552
	.02 mfd/500V	426-010763
	.05 mfd/100V	427-170095

124-000350 U/M SYNTH. PERCUSSION BOARD

PWB (NO PARTS)		023-049697
TRANSISTORS		
Q1-Q7		001-021172
Q8		001-021133
Q9-Q11		001-021260
DIODES		
C1-D10		001-226080
POTENTIOMETER		
R11	1000	676-000057
CAPACITORS		
ELECTROLYTIC	4.7mfd/50V	431-056509
	47mfd/50V	431-506509
	470mfd/35V	431-507359

124-000351 UPPER MANUAL PRESET BOARD

PWB (NO PARTS)		023-049703
TRANSISTORS		
Q1-Q18, Q26,27		001-021172
Q19-Q25		001-021134
DIODES		
D1-D47		001-226080
Locking Wafer Connector		005-051170
Wafer Assy.		005-044742

124-000352 LOWER MANUAL PRESET BOARD

PWB (NO PARTS)		023-049709
TRANSISTORS		
Q1-Q18		001-021172
DIODES		
D1-D30		001-226080

124-000352 REPEAT OSCILLATOR & DETECTOR BD.

PWB (NO PARTS)		023-049715
TRANSISTOR		
Q1,3,7,9,13,		
21,23,24		001-021134
Q14,20,22		001-021172
Q8	PUT	001-026050
DIODE		
D1-D14		001-226080
CAPACITOR		
Electrolytic		
	47mfd/25	431-506259

FUSE		
	1/2 Amp,Slo-Blo.	016-050540
	3 Amp, Regular	016-039515
	3 Amp,Slo-Blo.	016-050541
	4 Amp,Slo-Blo.	016-050542
	6-¼ Amp,Slo-Blo	016-039514
Fuse Clip		013-050528

124-000355 POWER SUPPLY & RELAY BOARD

PWB (NO PARTS)		023-024051
DIODE		
SILICON RECTIFIER		
D1-D5		001-024051
D6-D9		001-024061
CAPACITOR		
Electrolytic		
	500mfd/35V	431-507539
Relay		003-050472

124-000360 AUTO-ACCOMPANIMENT BOARD

PWB (NO PARTS)		023-049496
TRANSISTOR		
Q1,2		001-021260-001
Q3,4,7		001-021133
Q5		001-021132
Q6,9,10,13,19,20		001-021135
Q8,21		001-021260
Q11,14,15,16,18		001-021172
Q12,17		001-021173
DIODES		
D1-D5,D8-13		001-226080
CAPACITOR		
Electrolytic		
	4.7/50V	431-056509
	10/50V	431-106509
	22/50V	431-256509
	100/15V	432-107159
	100/25V	431-107259
	200/35V	431-207359
POTENTIOMETER		
	20K	676-000065
	100K	676-000073

124-000365 MISCELLANEOUS BOARD

PWB (NO PARTS)		023-049999
TRANSISTORS		
Q1,2,3,6		001-021172
Q4,5		001-021133
Q7		001-021260
CAPACITOR		
Tantalum		
	.47mfd/25V	414-240052
	1.0mfd/25V	414-240092
Electrolytic		
	4.7mfd/50V	431-056509
	47mfd/25V	431-506259

124-000374 MIXER #2 BOARD

PWB(NO PARTS)		023-046800
CAPACITORS		
Electrolytic		
	10mfd/50V	432-106509
	200mfd/35V	431-027359
TRANSISTORS		
Q1 thru 7, 12,13		001-021135
Q8 thru 11		001-021172
DIODE		
D1		001-226080

124-000376 MIXER BOARD #2

PWB (NO PARTS)		023-046800
TRANSISTOR		001-021135
CAPACITOR		
Electrolytic		
	200 mfd/35V	431-207359
	10 mfd/50V	432-106509

124-000377 MIXER #3 BOARD

PWB (NO PARTS)		023-046806
TRANSISTORS		
Q1,2,4,5,6		001-021135
Q7		001-021260
POTENTIOMETER		676-000077
CAPACITOR		
Electrolytic		
	4.7mfd/50V	431-056509
	10mfd/50V	431-106509
	47mfd/25V	431-506259
	200mfd/35V	431-207359

124-000379 PATTERN GENERATOR BOARD

PWB (NO PARTS)		023-050654
TRANSISTORS		
Q1		001-026050
Q2,6,11,12,16,17		001-021133
Q7,8,15		001-021172
Q13,14		001-021135
DIODES		
D1,d-14		001-226080
INTEGRATED CIRCUIT		
IC1		075-000430
CAPACITORS		
CERAMIC	.01mfd/500V	426-010743
	.05mfc/100V	427-170095
Switch Assembly Rhythm		008-050612

124-000380 VOICING BOARD

PWB (NO PARTS)		023-050669
TRANSISTORS		
Q1,5,8,12,14		001-021134
Q6,7,10,11,13,19		001-021135
Q9		001-021211
Q15,16		001-021172
Q17,18		001-021260
Socket		004-048898
DIODES		
D1-D20		001-026080
Zener		
D21	14V,1W	001-023026
POTENTIOMETER	10K,1/8W	676-000064
	50K,1/8W	676-000069
CAPACITOR		
TANTALUM	.047/35V	435-474352
	1.0/35V	435-105354
ELECTROLYTIC	10/50V	432-106509
	200/35V	431-207359
Choke		
L1,L2	45mH	003-030753

124-000418 VARIATION BOARD

PWB (NO PARTS)		023-050937
TRANSISTORS		
Q1,8		001-021135
DIODES		
D1,13		001-026080
INTEGRATED CIRCUIT		
IC1,IC2		075-000100
Switch Variation		008-050673
Lamp, Indicator		016-050949

124-000424 AUTO-ACCOMPANIMENT BOARD

PWB (NO PARTS)		023-051381
TRANSISTOR		
Q1,7,11,16	NPN	001-021134
Q8,12	NPN	001-021135
Q1 thru 6,15	PNP	001-021172
Q9,13		001-021173
Q10,14	NPN	001-021260
DIODES		
D1 THRU 13		001-226080
POTENTIOMETER	10K	676-000064

124-000430 AUTO VARI-28 BOARD

PWB (NO PARTS)		023-051407
TRANSISTOR		
Q1,2,8,11,14	NPN	001-021133
Q19,20,21,24,25, 26	NPN	001-021134
Q10,23	NPN	001-021135
Q3 thru 7,9,12	PNP	001-021172
Q15 thru 18	PNP	001-021173
Q22	NPN	001-021260
Q13	PUT	001-021250
INTEGRATED CIRCUIT		
IC2		075-000100
IC3		075-000300
IC1		075-000430
Socket		004-046770
Diodes		
D1 thru 25,27 thru 35,37		001-026080
Choke		
L1		003-030753
Switch Assy.		008-051335
Lubricant		015-051448
Wafer Assy.		
W1,4		005-044532
Wafer Connector		
W2,3,7,9		005-051170
Wafer Connector		
W5,6,10		005-051168
Wafer Assy		
W8		005-0044742
W11		005-044535
Wafer Connector		
W12		005-051169
Potentiometer w/switch		676-000286

124-000444 AUTO ACCOMPANIMENT BOARD

PWB (NO PARTS)		023-051519
TRANSISTOR		
Q5	NPN	001-021132
Q3,4,7	NPN	001-021133
Q9,10,13,19,20		001-021135
Q6,8,21	NPN	001-021260
Q11,14,15,16,18	PNP	001-021172
Q12,17		001-021173
Q1,2		001-021260-001
DIODE		
D1 thru 13		001-226080
POTENTIOMETER		
R1,31		676-000065
R18		676-000073

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